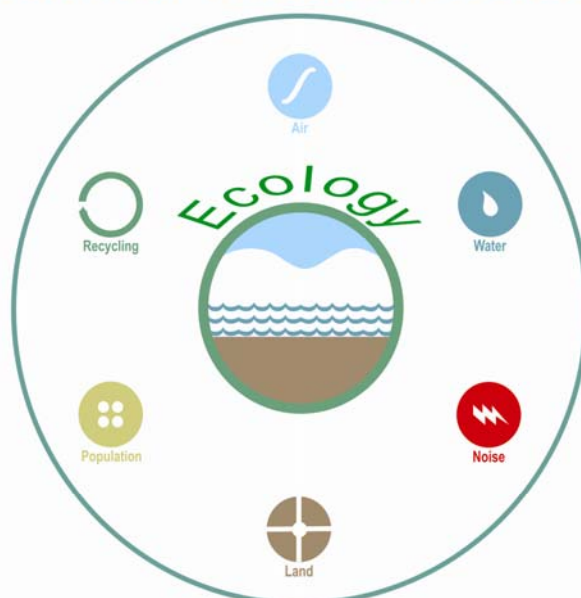


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**Supplementary Note  
for  
EIA-EMP  
of  
Orient U/G Mine No.3  
(0.69 Mty)  
(0.2 Mty Incremental)**

**Ib Valley Coalfield  
Mahanadi Coalfields Limited**



**September 2012**



**Central Mine Planning & Design Institute Ltd.**  
(A Subsidiary of Coal India Ltd.)

Regional Institute-VII, OSHB Building, Bhubaneswar, Orissa 751001

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**ORIENT U/G MINE NO.3**  
**(0.69 MTY; 0.20 MTY INCREMENTAL)**

**INTRODUCTION**

Expert Appraisal Committee (EAC) (Thermal & Coal Mining) meeting was held on 23<sup>rd</sup> – 24<sup>th</sup> May 2011 for consideration of EIA-EMP of Orient U/G Mine No.3 (0.49 Mty to 0.69 Mty) (i.e. 0.20 Mty incremental) of M/s. Mahanadi Coalfields Limited, located in Ib Valley Coalfields, Jharsuguda district of Odisha. MoEF has after detailed deliberation of EIA-EMP of the project in the EAC meeting sought the following information / data (Annexure-I) to further consider for environmental clearance.

1. The Committee desired that a time-bound programme for the implementation of commitments made during Public Hearing.
2. The Committee observed that the data generated on baseline environmental quality of air, water and noise is old (2005-06) and noted that the same data has been shown for two different seasons – pre-monsoon and post monsoon which is not realistic.
3. The Committee also observed that no monitoring station has been provided in the southern direction (down wind direction) which should be established.
4. The Committee desired that a one season data which includes PM10 and PM2.5 should be collected for the same season as meteorological data and furnished.
5. The Committee that the coal being transported by road be also dispatched by conveyor system to be established within 2-3 years to a common CHP and loading should be by bulk loaders.
6. The Committee also sought a Plan with time bound commitment for implementation of issues raised in the Public Hearing.
7. The Committee sought FC for the forestland involved in the project.

This report has been prepared incorporating the point-wise replies to the above queries for submission to MoEF, Govt. of India.

## Point-wise Replies to MoEF Queries

### Point No.(1)

**The Committee desired that a time-bound programme for the implementation of commitments made during Public Hearing.**

TIME BOUND PROGRAMME FOR POINT-WISE COMPLIANCE OF THE POINTS RAISED IN THE PUBLIC HEARING FOR ORIENT MINE NO.3 HELD ON 23.04.10 AT 9:00AM FOR EXPANSION OF COAL PRODUCTION FROM 0.49 MTPA TO 0.69 MTPA.

| Sl. No. | Points raised during public hearing   | Details of compliance already made   | Time bound action plan |             |         |             |         |             |         |             |         |             |  |
|---------|---|--|------------------------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|-------------|--|
| 1       | The mine authority should adopt proper and adequate dust suppression measures at the coal transportation road and in the locality to avoid dust nuisance                                    | The mine authority has provided water spraying arrangements through water tankers on the coal transportation road and they will continue the same management practice in the expansion proposal with increase in the frequency and quantum of spraying   | Compliance made        |             |         |             |         |             |         |             |         |             |  |
| 2       | The mine authority should provide medical facilities at the colliery hospital for the general public  | The mine authority is conducting regular health camps in the project affected villages and moving health camps are being organized from time to time. They will continue to do so in future also. Apart from this, in the colliery hospital and central hospital, treatment is also being done for the villagers with very nominal charges   | Compliance made        |             |         |             |         |             |         |             |         |             |  |
| 3       | The mine authority should plant more trees and they should protect the same to have more survival rate at the same time the mine authority should submit plantation figure for last 5 years | <p>The mine authority is planting trees every year during monsoon period. The protection of plant is social responsibility and the plants can be protected with combined efforts from the villagers and mine authority. This year they have proposal to plant 12,500 trees north side of Orient Mine No.3. The plantation figures for last five years is as below :</p> <table><tr><td>2007-08</td><td>12,500 nos.</td></tr><tr><td>2008-09</td><td>22,500 nos.</td></tr><tr><td>2009-10</td><td>20,500 nos.</td></tr><tr><td>2010-11</td><td>14,000 nos.</td></tr><tr><td>2011-12</td><td>11,600 nos.</td></tr></table> <p>Plantation is being done through Odisha Forest Development Corporation (OFDC), which is a state Govt. organization. Maintenance and growth of such trees to be done by the same organization is also included in the contract agreement.</p> | 2007-08                | 12,500 nos. | 2008-09 | 22,500 nos. | 2009-10 | 20,500 nos. | 2010-11 | 14,000 nos. | 2011-12 | 11,600 nos. | More plantation shall be done. 12,500 nos. plantation awarded to OFDC for 2012-13. |
| 2007-08 | 12,500 nos.   |  |                        |             |         |             |         |             |         |             |         |             |  |
| 2008-09 | 22,500 nos.   |  |                        |             |         |             |         |             |         |             |         |             |  |
| 2009-10 | 20,500 nos.   |  |                        |             |         |             |         |             |         |             |         |             |  |
| 2010-11 | 14,000 nos.   |  |                        |             |         |             |         |             |         |             |         |             |  |
| 2011-12 | 11,600 nos.   |  |                        |             |         |             |         |             |         |             |         |             |  |

|   |  |   |  |
|---|--|---|--|
| 4 | The mine drainage water should be treated properly and maximum quantity should be supplied to the nearby villagers for various uses.   | The mine authority is providing mine drainage water by engaging 3 pumps and after treatment, it is supplied to colony and villagers through kuchha drain.   | Water supply through pipe line for three villages namely Kualapara, Nuaparah, Lamibahal. Estimated cost is Rs.50.00 lakhs. Tentative completion date March,2013. Pucca drain water supply Chauakani village. Estimated cost is Rs.5.00 lakhs by March,2013.  |
| 5 | The mine authority should take precautionary measures to avoid lowering of water table in the area due to their underground mining activities  | The working in Orient Mine No.3 is in Lajkura seam and there is a huge and extensive aquifer strata above this seam, which is not disturbed by underground mining activities, which may further be envisaged from low make up water in the underground workings and thus the water table in the area is maintained. | At present development of the panel is under progress, the aquifer strata above the working is not disturbed. During depillaring stage the aquifer strata will be disturbed. Water balance study reveals that this area is sustaining by average annual rainfall of 1528mm. The annual rainfall recharge and ground water draft (including present and future draft) are estimated as 103.66 Mm <sup>3</sup> and 52.42Mm <sup>3</sup> respectively for the zone surrounding 10 km around the periphery of the core zone of the project. This signifies that the average rainfall replenish the annual ground water draft every year. However, the check dams will be constructed in the upstream of Khairol stream and Bagachoppa draining in and around area to improved the surface run-off and enhancing recharge of the aquifer in the area for mitigating the declining of ground water level surrounding the project. Tentative location of check dams on the drainages and nearby villages is given in plate _____. |
| 6 | The mine authority should take adequate dust suppression measures at the Orient Railway siding and this should be operated all the time and at the same time the mine authority should take initiation for shifting of this siding away from the township. | The mine authority provided water spraying arrangement at Orient colliery siding through laying of hydrant and tap points and also regular sprinkling is being done through mobile tanker.  | In addition to this, installation of fixed gun type water sprinklers will be installed and commissioned within 8 (eight) months time i.e. by April, 2013, which has already been processed. Further, OC siding is half siding and hardly one rake is being loaded in 3-4 days i.e. average loading of rakes is only 10-12 per month at present and there is no plan for immediate increase in this average handling. Again, shifting of this siding is not possible because of non-availability of land at a suitable location and also other technical consideration. Also, the surrounding locality is   |

|   |   |  |   |
|---|---|--|---|
|   |   |  | mostly unauthorized encroachers, for which, eviction process has already been initiated under Public Premises Act.  |
| 7 | The mine authority should carryout sand stowing in the underground mined out area.          | NIL  | Coal is extraverted by conventional Board & Pillars method mining which involves development and depillaring operation. Presently only development operation is in progress. Depillaring operation shall be done as per the plan and procedure approved by DGMS. Sand stowing shall be done as per the approved plan. |
| 8 | The mine authority should clarify that why they have sealed the bore well in Sanjob village | Since the bore-well dug at Sanjob village was at unsafe zone for underground mine, which was connecting gallery of the underground mine and was a source of heavy inrush of water through overlying aquifer strata, it had to be sealed off. | However, mine authority has already discussed with the villagers and located two nos. of sites for bore well without disturbing the aquifer strata or without posing any threats to the underground mine and also committed to dig such bore wells by March,2013, for which , action has already been initiated.      |

### Point No. (2)

**The Committee observed that the data generated on baseline environmental quality is old (2005-06) and noted that the same data has been shown for two different seasons – pre-monsoon and post monsoon which is not realistic.**

Afresh baseline environmental quality data for air, water, noise and soil has been generated for pre-monsoon season March, April and May 2012. The baseline data has been generated by M/s.Richardson & Cruddas (1972) Ltd. and the data annexed in Annexure-II.

### Point No. (3)

**The Committee also observed that no monitoring station has been provided in the southern direction (down wind direction) which should be established.**

Hourly meteorological data for wind velocity and wind direction for the pre-monsoon period from March, April & May 2012 has been collected and given in page 21 to 22 of Annexure-II. The wind-rose made from these data shows that the pre-dominant wind direction is from South West to North East. Eight air quality monitoring

stations have been fixed covering Orient Group of Mines (Page 32 in Annexure-II). The air quality monitoring station Core Zone (Near temple) (A2) which falls near to the village khukhmal is directly on the south of the Orient Mine No.3. Whereas the air quality station A5 at Gandhi Chowk is on the down wind direction (NE) of the Orient U/G Mine No.1&2. The recorded ambient air quality data for these stations during pre-monsoon season March, April & May 2012 is given in Page 38 to 46 in Annexure-II.

#### Point No. (4)

**The Committee desired that a one season data which includes PM<sub>10</sub> and PM<sub>2.5</sub> should be collected for the same season as meteorological data and furnished.**

Ambient air quality data PM<sub>10</sub> and PM<sub>2.5</sub> has been generated for the same season as meteorological data for pre-monsoon period March, April and May 2012. The recorded data has been given in Annexure-II. The abstract of the ambient air quality data and wind-rose for the pre-monsoon are given below:

(Fig. in  $\mu\text{g}/\text{m}^3$ )

| Location name & code         | Min | 98 <sup>th</sup> Per. | Max | AM    | GM    | Std.dev | CPCB Limit |
|------------------------------|-----|-----------------------|-----|-------|-------|---------|------------|
| PM10                         |     |                       |     |       |       |         |            |
| Corezone (Store) (A1)        | 64  | 94                    | 94  | 84.0  | 83.8  | 6.1     | 100        |
| Core zone (Near Temple) (A2) | 89  | 115                   | 115 | 100.9 | 100.7 | 6.8     |            |
| Mandlia (A3)                 | 66  | 82                    | 82  | 75.9  | 75.8  | 4.3     |            |
| Gandghora (A4)               | 65  | 77                    | 77  | 71.0  | 70.9  | 3.8     |            |
| Gandhi Chowk (A5)            | 68  | 81                    | 81  | 73.8  | 73.7  | 3.6     |            |
| Chheikuthi (A6)              | 58  | 84                    | 84  | 71.6  | 71.2  | 8.2     |            |
| Jamkani (A7)                 | 52  | 62                    | 62  | 49.8  | 49.5  | 5.8     |            |
| Lajkura (A8)                 | 50  | 70                    | 70  | 58.3  | 58.0  | 5.6     |            |
| PM2.5                        |     |                       |     |       |       |         |            |
| Corezone (Store) (A1)        | 19  | 28                    | 28  | 25.2  | 25.1  | 1.9     | 60         |
| Core zone (Near Temple) (A2) | 28  | 37                    | 37  | 32.3  | 32.3  | 2.2     |            |
| Mandlia (A3)                 | 23  | 29                    | 29  | 26.5  | 26.5  | 1.5     |            |
| Gandghora (A4)               | 23  | 27                    | 27  | 24.9  | 24.9  | 1.4     |            |
| Gandhi Chowk (A5)            | 26  | 31                    | 31  | 28.0  | 28.0  | 1.3     |            |
| Chheikuthi (A6)              | 20  | 29                    | 29  | 24.4  | 24.2  | 2.9     |            |
| Jamkani (A7)                 | 14  | 21                    | 21  | 16.9  | 16.8  | 2.0     |            |
| Lajkura (A8)                 | 17  | 24                    | 24  | 19.8  | 19.7  | 1.9     |            |

| Location name & code         | Min  | 98 <sup>th</sup> Per. | Max  | AM   | GM   | Std.dev | CPCB Limit |
|------------------------------|------|-----------------------|------|------|------|---------|------------|
| SO <sub>2</sub>              |      |                       |      |      |      |         |            |
| Corezone (Store) (A1)        | 11.0 | 17.0                  | 17.0 | 13.9 | 13.8 | 1.6     | 80         |
| Core zone (Near Temple) (A2) | 13.7 | 16.6                  | 16.6 | 15.4 | 15.4 | 0.7     |            |
| Mandlia (A3)                 | 14.2 | 16.0                  | 16.0 | 15.0 | 15.0 | 0.5     |            |
| Gandghora (A4)               | 17.6 | 20.4                  | 20.4 | 18.7 | 18.7 | 0.9     |            |
| Gandhi Chowk (A5)            | 14.0 | 16.8                  | 16.8 | 15.1 | 15.1 | 0.9     |            |
| Chheikuthi (A6)              | 10.6 | 13.8                  | 13.8 | 11.7 | 11.7 | 0.9     |            |
| Jamkani (A7)                 | 10.0 | 13.1                  | 13.1 | 11.4 | 11.4 | 0.8     |            |
| Lajkura (A8)                 | 10.3 | 13.7                  | 13.7 | 11.4 | 11.3 | 0.8     |            |
| NO <sub>x</sub>              |      |                       |      |      |      |         |            |
| Corezone (Store) (A1)        | 12.9 | 24.6                  | 24.6 | 17.4 | 17.0 | 4.1     | 80         |
| Core zone (Near Temple) (A2) | 14.8 | 19.5                  | 19.5 | 17.8 | 17.8 | 1.3     |            |
| Mandlia (A3)                 | 17.6 | 20.3                  | 20.3 | 19.0 | 19.0 | 0.8     |            |
| Gandghora (A4)               | 17.0 | 19.5                  | 19.5 | 18.3 | 18.3 | 0.7     |            |
| Gandhi Chowk (A5)            | 16.9 | 19.4                  | 19.4 | 18.2 | 18.2 | 0.7     |            |
| Chheikuthi (A6)              | 16.2 | 19.3                  | 19.3 | 17.7 | 17.7 | 0.9     |            |
| Jamkani (A7)                 | 13.3 | 16.7                  | 16.7 | 14.8 | 14.7 | 1.0     |            |
| Lajkura (A8)                 | 16.5 | 19.9                  | 19.9 | 18.0 | 18.0 | 1.0     |            |
| NH <sub>3</sub>              |      |                       |      |      |      |         |            |
| Corezone (Store) (A1)        | 13   | 26                    | 26   | 19.0 | 18.7 | 3.5     | 400        |
| Core zone (Near Temple) (A2) | 10   | 20                    | 20   | 14.5 | 14.3 | 2.7     |            |
| Mandlia (A3)                 | 14   | 25                    | 25   | 20.2 | 19.9 | 3.1     |            |
| Gandghora (A4)               | 14   | 25                    | 25   | 18.6 | 18.4 | 2.9     |            |
| Gandhi Chowk (A5)            | 16   | 25                    | 25   | 20.3 | 20.2 | 2.2     |            |
| Chheikuthi (A6)              | 20   | 28                    | 28   | 23.6 | 23.5 | 2.2     |            |
| Jamkani (A7)                 | 11   | 20                    | 20   | 15.3 | 15.1 | 2.3     |            |
| Lajkura (A8)                 | 13   | 22                    | 22   | 17.3 | 17.1 | 2.3     |            |

Note : All CO, Benzene and BaP values were found to be BDL.

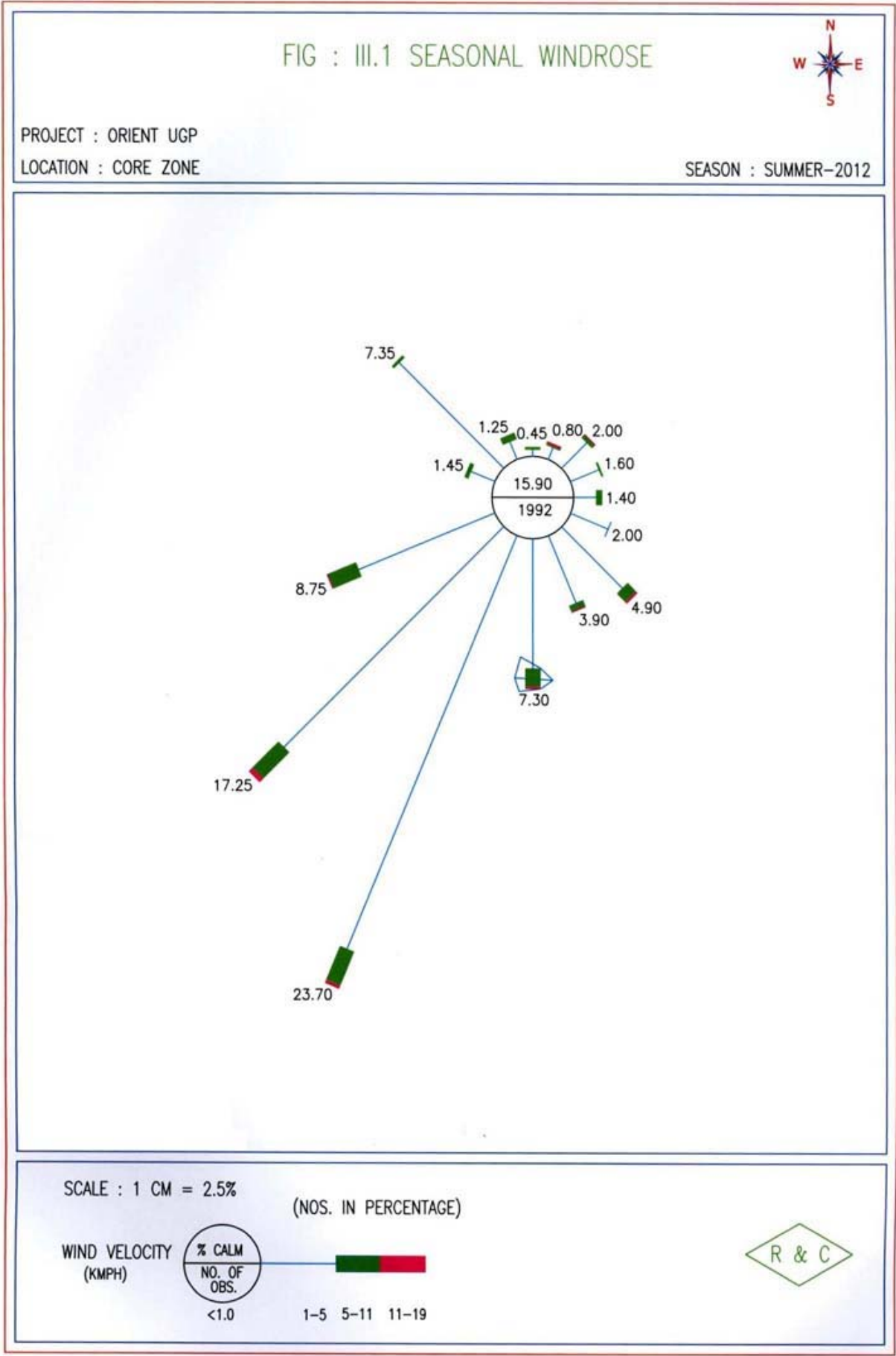


FIG : III.2 DAY TIME &amp; NIGHT TIME WINDROSES



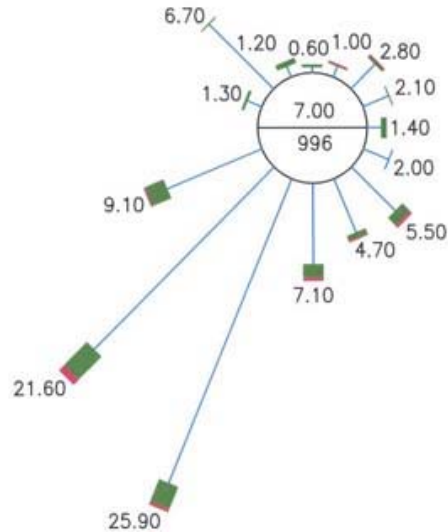
PROJECT : ORIENT UGP

LOCATION : CORE ZONE

SEASON : SUMMER-2012

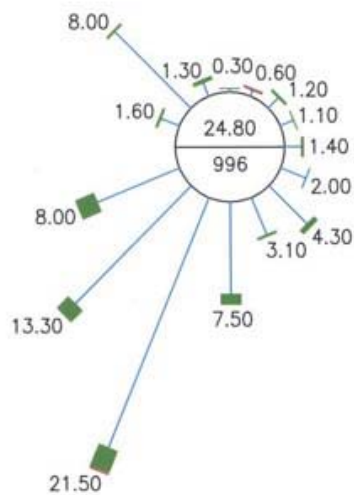
DAY TIME

TIME: 06.00hrs. TO 18.00hrs.



NIGHT TIME

TIME: 18.00hrs. TO 06.00hrs.



SCALE : 1 CM = 5%

(NOS. IN PERCENTAGE)

WIND VELOCITY  
(KMPH)

1-5 5-11 11-19

R &amp; C

**Point No. (5)**

**The Committee that the coal being transported by road be also dispatched by conveyor system to be established within 2-3 years to a common CHP and loading should be by bulk loaders.**

Railway siding is situated 800 m away from Orient U/G Mine No.3. Maximum coal production is 2046 te/day. Tippers having capacity of 16 te are plying 100 trips per day to railway siding. A dedicated coal transportation road having 9.0 m width consisting greenbelt plantation for dust suppression is existing. The existing year wise greenbelt plantation along both side of the road is:

| Year    | Sapling planted (Nos.) |
|---------|------------------------|
| 2009-10 | 22,000                 |
| 2010-11 | 14,000                 |
| 2011-12 | 11,600                 |

Length and breadth of the railway siding is 300 m x 200 m having 2 nos. platform. Two nos. of fixed sprinklers are functioning at railway siding for dust suppression.

Contractual one number mobile tankers having capacity of 4000 litres is sprinkling water 10 trips a day on coal transportation road and 5 trips/day in Railway siding. However, the provision of conveyer system from the mine head to the siding is under consideration and a study is being made to plan this system

**Point No. (6)**

**The Committee desired that a time-bound programme for the implementation of commitments made during Public Hearing.**

Kindly refer the replies of Point No. 1

**Point No. (7)**

**The Committee sought FC for the forestland involved in the project.**

The total forest land area within the mining lease hold area of Orient Mine No.3 is 865.464 ha. Mining permission for the said forest land has already been applied and all compliances has already been made with payment of NPV including submission of DGPS maps duly authenticated by ORSAC and is pending with CCF (Nodal), Bhubaneswar for forwarding the same of MoEF, New Delhi at the earliest.

**Orient UG Mine No.3 (Expn. from 0.49 MTPA to 0.69 MTPA  
in an area of 1504.559 ha) of M/s.Mahanadi Coalfields Ltd.,  
in dist. Jharsuguda, Orissa (EC based on TOR granted on 14.07.2008)**

The proponent made a presentation. It was informed that the proposal is for expansion in production from 0.49 MTPA to 0.69 MTPA) and production of 0.69 MTPA has already been reached and the proposal is for 'regularization' of production. Of the total area of 1504.559 ha, 868.216 ha is forestland, 372.145 ha is agricultural land 9.20 ha is surface water body, 254.998 ha is Govt. & tenancy land. Of the total 1504.559 ha, 1421.757 ha is ML area, 56.812 ha is for infrastructure & buildings, 13.44 ha is roads, 8 ha is coal stockyard and 0.11 ha is Inclines and 4.44 ha is magazine . Mining is mechanized using Board & Pillar method including 3 additional LHDs for the expansion in production. Grade of coal is 'D?'. Subsidence study has been carried out by CIMFR, Dhanbad and the max. tensile strain of 8.06 m<sup>3</sup>/d includes 630 m<sup>3</sup>/d for domestic consumption is met from mine water and IWSS and 105 m<sup>3</sup>/d for mine operations is from mine water discharge. A provision of Rs.1480 lakhs has been made for CSR. The project does not involve R&R. The major part of the mine is drained by Bachoppa stream which joins River Ib in the east. Coal would be transported by belt conveyor onto surface bunkers from where it would be dispatched directly to small consumers by road using 54 trucks of 18 T capacity, and to major consumers such as Rourkela Steel Plant and Tamil Nadu State Electricity Board and basket linkage by rail from Orient Railway Siding at a distance of 1.5 km covered by road. It was informed that application for Stage-I FC has been applied for on 11.06.2010. MoC has approved the Mining Plan on 28.08.2009. Public Hearing was held on 23.04.2010. Balance life of the mine is 40 years.

The committee desired that a time bound programme for the implementation of commitments made during Public Hearing. The Committee observed that the data generated on baseline env. Quality of air, water and noise is old (2005-06) and noted that the same data has been shown for two different seasons – pre-monsoon and post monsoon which is not realistic. The Committee also observed that no monitoring station has been provided in the southern direction (down wind direction) which should be established. The committee desired that a one season data which includes PM10 and PM2.5 should be collected for the same season as met. data and furnished. The Committee desired that the coal being transported by road be also dispatched by conveyor system to be established within 2-3 years to a common CHP and loading should be by bulk loaders. The Committee also sought a Plan with time bound commitment for implementation of issues raised in the Public Hearing. The Committee sought FC for the forestland involved in the project. The Committee decided to further consider based upon receipt of the aforesaid details.

**Baseline Environmental Data Generation  
for  
Orient UGP in Ib Valley area of  
Mahanadi Coal fields Limited,  
Odisha state**

**Season  
Summer 2012**

***Client***  
**CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED**  
**Regional Institute – VII, Bhubaneswar**

***Prepared by***



**M/s. RICHARDSON & CRUDDAS (1972) LTD.**

(A Government of India Undertaking)

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**June 2012**

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## FOREWORD

**Environmental Management Plan (EMP)**, for a Coal Mining project is a prerequisite and the same constitutes basis for environmental appraisal of the project and its clearance from MoEF. In this context, baseline data of environmental quality (ambient air along with micrometeorology, water, noise, soil, etc.) has to be generated prior to the preparation of EMP.

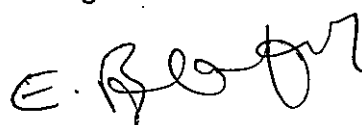
**Central Mine Planning and Design Institute Ltd. (CMPDI)**, Regional Institute-VII, Bhubaneswar, a subsidiary of Coal India Ltd. (CIL) has undertaken the task of preparation of EMP for coal projects under the jurisdiction of CIL. **Mahanadi Coalfields Ltd. (MCL)**, **Sambalpur** a subsidiary of CIL has several ongoing mining projects in **IB valley Area** and has proposed operating **Orient UGP** for baseline data generation for environmental appraisal & its clearance.

CMPDI, Regional Institute -VII, Bhubaneswar which undertakes planning and design of mining projects for MCL, desired to have a existing environmental status of the operating Orient UGP in IB valley Area, MCL for preparing EIA & EMP. Hence, it entrusted the task of one complete season baseline environmental data generation to M/s. Richardson & Cruddas (1972) Ltd., a Government of India undertaking, Chennai through the work order No. CMPDI/RI-VII/CIVIL/2012/2722 dtd.13.02.2012.

The baseline data on micrometeorology, Ambient air quality, Noise level, Water / Waste water quality and soil quality collected during Summer season (05<sup>th</sup> March 2012 to 26<sup>th</sup> May 2012) are presented in this report.

Grateful thanks are due to the **Regional Director, Regional Institute-VII, CMPDI, Bhubaneswar** for the opportunity provided to be associated in this endeavor. The co-operation rendered by CMPDI, RI-VII and MCL Project authorities and their supporting staff is gratefully acknowledged.

13<sup>th</sup> June 2012  
Chennai

  
(E. BALAKRISHNAIAH)  
Unit In-charge

### Project Personnel

| Name                         | Qualification  | Designation                      | Experience (Years) |
|------------------------------|--|----------------------------------|--------------------|
| <i>Mr. E. Balakrishnaiah</i> | B.Tech. (Civil), M.E. (Env. Engg.)<br>Lead EMS Auditor (ISO 14001) | Incharge<br>Env. Engg & Projects | 20                 |
| Mr. P. Subburam              | M.Sc.  | Senior Analyst                   | 16                 |
| Mr. M.N. Anil Kumar          | B.Sc., EMS & ISO 14000   | Senior Analyst                   | 16                 |
| Mr. S.K. Mishra              | B.Sc.  | Sr. Analyst                      | 15                 |
| Mr. V. Arun Kumar            | Dip. Chem. Tech., D.C.P.I.C.                                       | Sr. Engineer                     | 12                 |
| Mr. M. Venumadhav            | M.Tech. (Civil)  | Project Engineer                 | 7                  |
| Mr. B. Senthil Kumar         | Dip. Chem. Tech.,<br>B.S.Engg.(Ind.tech)                           | Sr. Engineer                     | 12                 |
| Mr. K. Vijayakumar           | B.Sc   | Site Analyst                     | 6                  |
| Mr. K. Seetharaman           | B.E.M.   | Site Analyst                     | 6                  |
| Mr.V.Mayakkannan             | B.Sc   | Analyst                          | 6                  |
| Mr. Annamalai                | M.Sc.  | Site Analyst                     | 5                  |
| Mr.Raguvaran                 | B.Sc   | Analyst                          | 4                  |
| Mr. S. Ravichandran          | M.A., Dip. Multi. & Web  | System Analyst                   | 17                 |

## EXECUTIVE SUMMARY

1.0 Central Mine Planning and Design Institute Ltd., Regional Institute-VII, Bhubaneswar is preparing Environmental Impact Assessment & Environmental Management Plan (EIA & EMP) for obtaining environmental clearance for **operating Orient UGP** in IB valley Area, MCL. It entrusted one complete season baseline environmental data generation work to M/s. Richardson & Cruddas (1972) Ltd., Chennai, a Government of India undertaking.

2.0 Baseline data on environmental quality for Summer season are collected for 83 days during the period from 05<sup>th</sup> March to 26<sup>th</sup> May 2012. The study carried out during the said period is reported below.

### 3.0 APPROACH METHODOLOGY

#### 3.1 Micrometeorological data generation

A meteorology station has been set up at core zone and micrometeorological parameters like wind velocity, wind direction, temperature, relative humidity, cloud cover etc. are recorded on hourly basis for Summer season. Daily rainfall also has been recorded and reported.

#### 3.2 Ambient air quality monitoring

Ambient air quality was monitored at 8 locations i.e. two in core zone and the remaining six in buffer zone. A total of 24 samples (24-hrly) for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO, O<sub>3</sub>, NH<sub>3</sub> samples were collected from each location during the study period. Heavy metals samples were also collected once in the study period.

#### 3.3 Water quality monitoring

Representative water samples 9 nos. one in mine effluent, four in surface water and four from ground water i.e. dugwell and tube well in buffer zone have been collected, preserved and transported to R&C Environmental Engg. Laboratory, Chennai and analyzed as per standard methods.

### 3.4 Noise levels recording

Noise levels were recorded by using CYGNET Integrated sound level meter (100X) from eight ambient air quality locations during day time and night time at an interval of four hours for one day for three months.

### 3.5 Soil quality monitoring

Soil samples from five locations, three in core zone, two in buffer zone were collected at depths of 30, 60 and 100 cms and analysed for various physico-chemical and fertility parameters.

## 4.0 DATA ANALYSIS AND RESULTS

### 4.1 Micrometeorology

The wind velocity readings were ranging from <0.4 - 18.8 m/sec. Predominant wind was from South-West direction. The maximum temperature recorded was 44.0°C and the minimum was 20.5 °C. The relative humidity ranges from 27% to 82% and no rainfall was recorded during the study period.

### 4.2 Air quality

#### Core zone

PM<sub>10</sub> and PM<sub>2.5</sub> values are ranging from 64 µg/m<sup>3</sup> to 115 µg/m<sup>3</sup> and 19 µg/m<sup>3</sup> to 37 µg/m<sup>3</sup> respectively. SO<sub>2</sub> and NO<sub>x</sub> values are varying between 11.0 to 17.0 µg/m<sup>3</sup> and 12.9 to 24.6 µg/m<sup>3</sup> respectively. The ammonia and Ozone was to found to be maximum extent of 26 µg/m<sup>3</sup>. *All the values are found to be within the CPCB Standards except PM<sub>10</sub>.*

#### Buffer zone

PM<sub>10</sub> and PM<sub>2.5</sub> values are ranging from 42 µg/m<sup>3</sup> to 84 µg/m<sup>3</sup> and 14 µg/m<sup>3</sup> to 31 µg/m<sup>3</sup> respectively. SO<sub>2</sub> and NO<sub>x</sub> values are varying between 10.3 to 20.4 µg/m<sup>3</sup> and 13.4 to 20.3 µg/m<sup>3</sup> respectively. The ammonia was to found to be maximum extent of 28 µg/m<sup>3</sup>. *All the values are found to be within the CPCB Standards.*

**Table – 4.2 Ambient Air Quality Status**(All units in  $\mu\text{g}/\text{m}^3$ )

| (All units in µg/m <sup>3</sup> ) |      |                       |      |       |       |         |            |
|-----------------------------------|------|-----------------------|------|-------|-------|---------|------------|
| Location name & code              | Min  | 98 <sup>th</sup> Per. | Max  | AM    | GM    | Std.dev | CPCB Limit |
| PM10                              |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 64   | 94                    | 94   | 84.0  | 83.8  | 6.1     | 100        |
| Core zone (Near Temple) (A2)      | 89   | 115                   | 115  | 100.9 | 100.7 | 6.8     |            |
| Mandlia (A3)                      | 66   | 82                    | 82   | 75.9  | 75.8  | 4.3     |            |
| Gandghora (A4)                    | 65   | 77                    | 77   | 71.0  | 70.9  | 3.8     |            |
| Gandhi Chowk (A5)                 | 68   | 81                    | 81   | 73.8  | 73.7  | 3.6     |            |
| Chheikuthi (A6)                   | 58   | 84                    | 84   | 71.6  | 71.2  | 8.2     |            |
| Jamkani (A7)                      | 52   | 62                    | 62   | 49.8  | 49.5  | 5.8     |            |
| Lajkura (A8)                      | 50   | 70                    | 70   | 58.3  | 58.0  | 5.6     |            |
| PM2.5                             |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 19   | 28                    | 28   | 25.2  | 25.1  | 1.9     | 60         |
| Core zone (Near Temple) (A2)      | 28   | 37                    | 37   | 32.3  | 32.3  | 2.2     |            |
| Mandlia (A3)                      | 23   | 29                    | 29   | 26.5  | 26.5  | 1.5     |            |
| Gandghora (A4)                    | 23   | 27                    | 27   | 24.9  | 24.9  | 1.4     |            |
| Gandhi Chowk (A5)                 | 26   | 31                    | 31   | 28.0  | 28.0  | 1.3     |            |
| Chheikuthi (A6)                   | 20   | 29                    | 29   | 24.4  | 24.2  | 2.9     |            |
| Jamkani (A7)                      | 14   | 21                    | 21   | 16.9  | 16.8  | 2.0     |            |
| Lajkura (A8)                      | 17   | 24                    | 24   | 19.8  | 19.7  | 1.9     |            |
| SO <sub>2</sub>                   |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 11.0 | 17.0                  | 17.0 | 13.9  | 13.8  | 1.6     | 80         |
| Core zone (Near Temple) (A2)      | 13.7 | 16.6                  | 16.6 | 15.4  | 15.4  | 0.7     |            |
| Mandlia (A3)                      | 14.2 | 16.0                  | 16.0 | 15.0  | 15.0  | 0.5     |            |
| Gandghora (A4)                    | 17.6 | 20.4                  | 20.4 | 18.7  | 18.7  | 0.9     |            |
| Gandhi Chowk (A5)                 | 14.0 | 16.8                  | 16.8 | 15.1  | 15.1  | 0.9     |            |
| Chheikuthi (A6)                   | 10.6 | 13.8                  | 13.8 | 11.7  | 11.7  | 0.9     |            |
| Jamkani (A7)                      | 10.0 | 13.1                  | 13.1 | 11.4  | 11.4  | 0.8     |            |
| Lajkura (A8)                      | 10.3 | 13.7                  | 13.7 | 11.4  | 11.3  | 0.8     |            |
| NO <sub>x</sub>                   |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 12.9 | 24.6                  | 24.6 | 17.4  | 17.0  | 4.1     | 80         |
| Core zone (Near Temple) (A2)      | 14.8 | 19.5                  | 19.5 | 17.8  | 17.8  | 1.3     |            |
| Mandlia (A3)                      | 17.6 | 20.3                  | 20.3 | 19.0  | 19.0  | 0.8     |            |
| Gandghora (A4)                    | 17.0 | 19.5                  | 19.5 | 18.3  | 18.3  | 0.7     |            |
| Gandhi Chowk (A5)                 | 16.9 | 19.4                  | 19.4 | 18.2  | 18.2  | 0.7     |            |
| Chheikuthi (A6)                   | 16.2 | 19.3                  | 19.3 | 17.7  | 17.7  | 0.9     |            |
| Jamkani (A7)                      | 13.3 | 16.7                  | 16.7 | 14.8  | 14.7  | 1.0     |            |
| Lajkura (A8)                      | 16.5 | 19.9                  | 19.9 | 18.0  | 18.0  | 1.0     |            |
| NH <sub>3</sub>                   |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 13   | 26                    | 26   | 19.0  | 18.7  | 3.5     | 400        |
| Core zone (Near Temple) (A2)      | 10   | 20                    | 20   | 14.5  | 14.3  | 2.7     |            |
| Mandlia (A3)                      | 14   | 25                    | 25   | 20.2  | 19.9  | 3.1     |            |
| Gandghora (A4)                    | 14   | 25                    | 25   | 18.6  | 18.4  | 2.9     |            |
| Gandhi Chowk (A5)                 | 16   | 25                    | 25   | 20.3  | 20.2  | 2.2     |            |
| Chheikuthi (A6)                   | 20   | 28                    | 28   | 23.6  | 23.5  | 2.2     |            |
| Jamkani (A7)                      | 11   | 20                    | 20   | 15.3  | 15.1  | 2.3     |            |
| Lajkura (A8)                      | 13   | 22                    | 22   | 17.3  | 17.1  | 2.3     |            |

Note : All CO, Benzene and BaP values were found to be BDL.

### 4.3 Water quality

The water samples (9 Nos.) collected from different water sources i.e. Surface & ground water, mine effluent etc. are analysed as per procedures outlined in IS : 2488 / IS : 3025 / AWWA / APHA.

At all locations, oil and grease, phenolic compounds, cyanides, sulphides and insecticides are found to be absent and all heavy metal values except Iron are found to be below the detectable limit.

In general, water quality at eight locations is found to be within the prescribed limits.

**Table - 4.3(a) Waste water quality status**

| Source         | pH      | Suspended Solids (mg/l) | BOD (mg/l) | COD (mg/l) |
|----------------|---------|-------------------------|------------|------------|
| Mine discharge | 8.08    | 38                      | 8          | 52         |
| GSR 422E Norms | 5.5-9.0 | 100                     | 30         | 250        |

**Table - 4.3(b) Water quality status**

| Source                  | pH      |      | Turbidity (NTU) | TDS (mg/l) |     | Total Hardness (mg/l) |     | Iron (mg/l) |      | Chloride (mg/l) |     | Sulphate (mg/l) |     | Fluoride (mg/l) |      |
|-------------------------|---------|------|-----------------|------------|-----|-----------------------|-----|-------------|------|-----------------|-----|-----------------|-----|-----------------|------|
|                         | Min     | Max  |                 | Min        | Max | Min                   | Max | Min         | Max  | Min             | Max | Min             | Max | Min             | Max  |
| Drinking / Ground Water | 7.25    | 7.88 | 5               | 310        | 410 | 154                   | 182 | 0.08        | 0.12 | 40              | 88  | 14              | 24  | 0.09            | 0.01 |
| IS 105000 Norms         | 6.5-8.5 |      | 10              | 500-2000   |     | 300-600               |     | 0.3-1.0     |      | 250-1000        |     | 200-1000        |     | 1.0             |      |

**Table - 4.3(c) Surface water quality status**

| Source       | pH      |      | Colour (Hazen Units) |     | TDS (mg/l) |     | Iron (mg/l) |      | Chloride (mg/l) |     | Sulphate (mg/l) |     | Fluoride (mg/l) |      |
|--------------|---------|------|----------------------|-----|------------|-----|-------------|------|-----------------|-----|-----------------|-----|-----------------|------|
|              | Min     | Max  | Min                  | Max | Min        | Max | Min         | Max  | Min             | Max | Min             | Max | Min             | Max  |
| River        | 7.14    | 7.96 | 5                    | 18  | 254        | 612 | 0.09        | 0.24 | 54              | 174 | 14              | 68  | 0.10            | 0.30 |
| IS:2296-1982 | 6.5-8.5 |      | 300                  |     | 1500       |     | 50          |      | 600             |     | 400             |     | 1.5             |      |

#### 4.4 Noise levels

Mean  $L_{eq}$  noise levels at day time and night time are ranging from 41.5 to 60.0 dB(A) and 35.8 to 57.6 dB(A) respectively in the study area. While comparing with IS: 4954 -1986 norms for acceptable outdoor noise levels in residential area (55 dB(A)) in respect of buffer zone and Industrial area (75 dB(A)) in respect of core zone.

| S.No. | Zone        | Noise level (dB(A)) |             | Noise level Standards |           |
|-------|-------------|---------------------|-------------|-----------------------|-----------|
|       |             | Daytime             | Nighttime   | Daytime               | Nighttime |
| 1.    | Core zone   | 52.9 - 60.2         | 50.5 - 56.4 | 75                    | 70        |
| 2.    | Buffer zone | 40.5 - 48.7         | 35.8 - 43.2 | 55                    | 45        |

#### 4.5 Soil quality

The soil quality of the project area appears to be good and would support vegetation after suitable reclamation / modification.

*Table - 4.5 Soil quality status*

| S.No. | Parameters                  | Range of Concentration |
|-------|-----------------------------|------------------------|
| 1     | pH                          | 7.04 - 7.62            |
| 2.    | Organic Carbon (%)          | 0.3 - 4.6              |
| 3.    | Potassium (kg/ha)           | 110 - 164              |
| 4.    | Nitrogen (Kg/ha)            | 59.4 - 458             |
| 5.    | Available magnesium (Kg/Ha) | 94 - 422               |
| 6.    | Texture Class               | Sandy Loam             |

#### 5.0 CONCLUSIONS

The following conclusions are drawn based on the baseline data collected at core and buffer zone area.

- i) Ambient air quality parameters viz., PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, O<sub>3</sub> and Ammonia are well within the CPCB norms for industrial and rural areas.

- ii) The quality of mine water effluent is good even in untreated status. Further, the ground and surface water quality is also good and is well within the norms of IS : 10500-1991 and IS : 2296 - 1982 respectively. Therefore, the mixing of mine effluent will not have adverse effect on surface and ground water.
- iii) Most of the noise levels recorded are generally less than 65 dB(A) and are well within the acceptable outdoor noise levels in residential areas in respect of buffer zone and Industrial area in respect of core zone as per the norms of IS: 4954 - 1986.
- iv) The soil quality in the project area appears to be good and would support vegetation after suitable reclamation measures.

## LIST OF EQUIPMENT USED IN THE PROJECT

| Sl. No.                   | Name of the Equipment      | Make / Model             |
|---------------------------|----------------------------|--------------------------|
| <b>A. FIELD EQUIPMENT</b> |                            |                          |
| 1.                        | Respirable Dust Sampler    | Envirotech               |
| 2.                        | Fine Particulate sampler   | Envirotech               |
| 3.                        | Aneroid Barometer          | Imported                 |
| 4.                        | Wind Vane                  | Lawrence & Mayo          |
| 5.                        | Wet & Dry Bulb Thermometer | Lawrence & Mayo          |
| 6.                        | Whirling Hygrometer        | Lawrence & Mayo          |
| 7.                        | Cup Anemometer             | Lawrence & Mayo          |
| 8.                        | Hygrometer                 | Imported                 |
| 9.                        | Rain Gauge                 | Lawrence & Mayo          |
| 10.                       | Noise Level Meter          | CYGNET                   |
| <b>B. LAB EQUIPMENT</b>   |                            |                          |
| 11.                       | Single Pan Balance         | Mettler (Imported)       |
| 12.                       | Hot Air Oven               | Toshniwal                |
| 13.                       | Hot Plate                  | Instruments & Equipments |
| 14.                       | Muffle Furnace             | Toshniwal                |
| 15.                       | Water & Soil Analysis Kit  | Elico                    |
| 16.                       | Serological Water Bath     | M.C. Dalal               |
| 17.                       | BOD Incubator 20 ± 1°C     | M.C. Dalal               |
| 18.                       | Digital Spectrophotometer  | Elico                    |
| 19.                       | Refrigerator               | Godrej                   |

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| 4.1       | Ambient air quality monitoring stations | 23-23    |
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## 1.0 INTRODUCTION

**Environmental Management Plan (EMP)** for a Coal project is a prerequisite and the same constitutes basis for environmental appraisal of the project and its clearance from MoEF. In this context, baseline data of environmental quality (ambient air quality along with micrometeorology, water, noise, soil etc.) has to be generated prior to the preparation of EMP and it serves as pre-project datum lines for Environmental Impact Assessment (EIA).

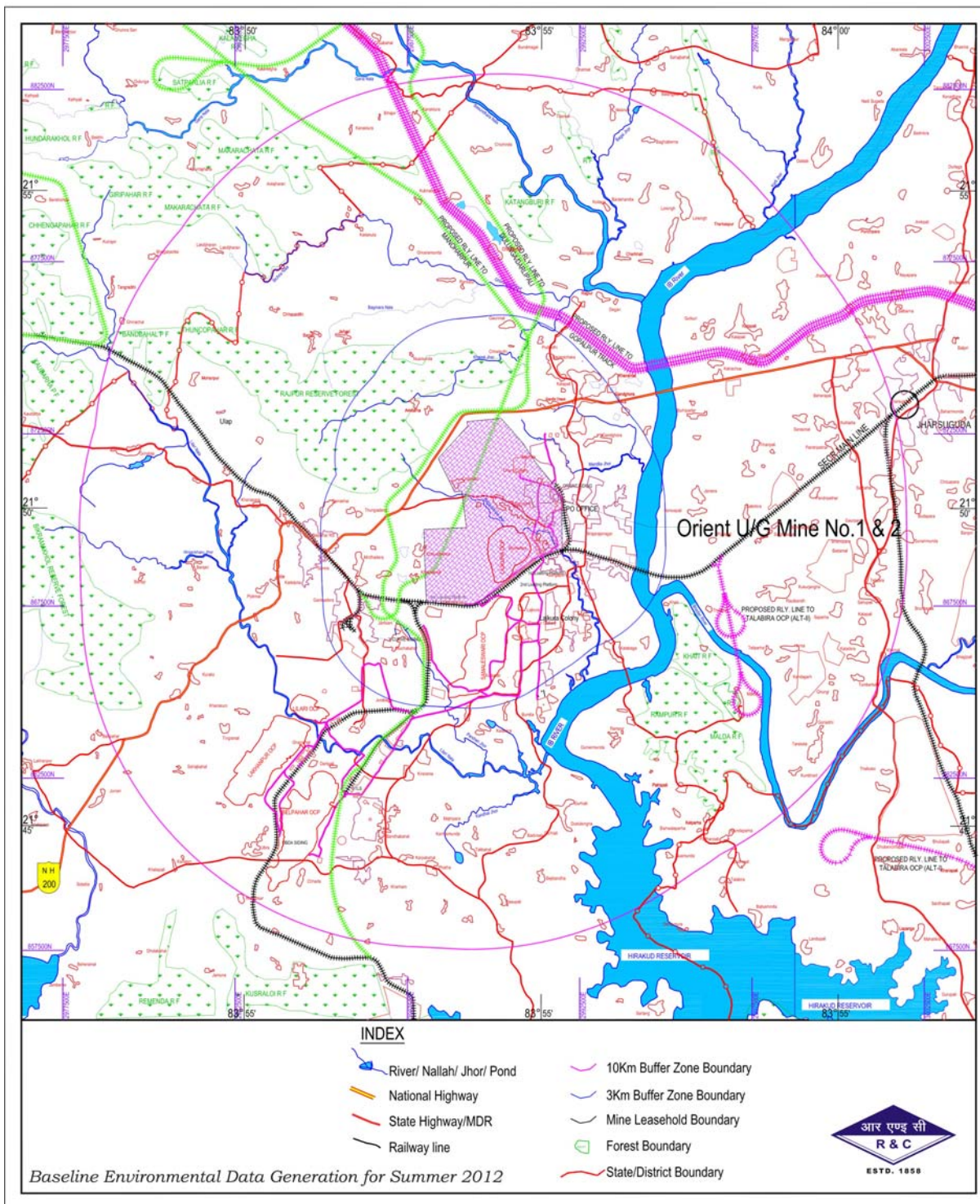
**Central Mine Planning and Design Institute Ltd. (CMPDI)**, RI-VII, Bhubaneswar a subsidiary of Coal India Ltd. (CIL) has undertaken the task of preparation of EMP for coal projects under the jurisdiction of CIL. **Mahanadi Coalfields Ltd. (MCL)**, **Sambalpur** a subsidiary of CIL, has several on going mining projects in **Ib Valley Coalfield** and has proposed **operating Orient UGP** for baseline data generation for environmental appraisal and its clearance.

CMPDI, Regional Institute -VII, Bhubaneswar which undertakes planning and design of mining projects for MCL, desired to have existing environmental status of the operating Orient UGP in Ib Valley area for preparing EIA & EMP. Hence, it entrusted the task of one complete season baseline environmental data generation to M/s. Richardson & Cruddas (1972) Ltd., a Government of India undertaking, Chennai.

The mine site environs are shown in Fig.I.1.

This report consists of baseline data collected from 05<sup>th</sup> March to 26<sup>th</sup> May 2012 representing Summer season for the proposed project.

**FIG.I.1 LOCATION MAP OF  
ORIENT UGP AND ITS ENVIRONS**



## 2.0 SCOPE AND METHODOLOGY

### 2.1 Preamble

The scope of the study and the present report covers the detailed characterisation of the existing environmental status in the study area for major environmental components viz. micrometeorology, ambient air quality, water/waste water quality, noise level and soil quality.

### 2.2 Micrometeorology

As a part of this study, micrometeorology and microclimatic parameters were recorded by installing a meteorological station at Core zone. Data of wind velocity, wind direction, ambient temperature, relative humidity and cloud cover were recorded at hourly intervals in a day throughout the study period. Further rainfall also has been recorded and reported.

Wind velocity and wind direction were recorded using cup anemometer and wind vane respectively. Ambient temperature was noted by wet and dry bulb thermometer. Relative humidity was measured from hygrometer and a self-recording rain gauge was used for rainfall data collection. Cloud cover data has been collected by visual inspection.

### 2.3 Ambient air quality

To assess the ambient air quality status, monitoring stations were identified on the basis of meteorology in the upwind and downwind direction as well as to represent the cross sectional scenario of the project site. Based on the production activities, the parameters chosen for assessment of air quality are Particulate Matter <10 (PM<sub>10</sub>), Particulate Matter <2.5 (PM<sub>2.5</sub>), Sulphur dioxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), Ammonia (NH<sub>3</sub>), Ozone (O<sub>3</sub>), Benzene, Benzo(a)pyrene and heavy metals.

Calibrated Respirable Dust sampler (with an average flow of 1.2 - 1.4 m<sup>3</sup>/min.) were used for monitoring of PM<sub>10</sub> and a tapping provided in the hopper of the same sampler was utilised for sampling of SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, NH<sub>3</sub> with proper flow controller (1 L/min). Calibrated APM 550 Fine Particle Sampler (with an average flow of 1.2

m<sup>3</sup>/min.) was used for monitoring of PM<sub>2.5</sub>. A temporary field laboratory for the purpose of calibration of equipments and standardisation of analytical procedures was also established. A digital imported CO detector was used for monitoring of CO. Collected samples were analysed on the day of sample collection with the following procedure.

#### **PM & PM<sub>10</sub>**

Calibrated Respirable Dust Sampler with Whatman's GF/A micro fibre filter paper was used for the determination of PM. PM<sub>10</sub> is a measure of particulate matter having size <10 microns. The dust particles having size >10 microns is being collected in the cyclone and measured. This along with PM<sub>10</sub> value gives total PM.

#### **PM<sub>2.5</sub>**

Calibrated APM 550 Fine Particle Sampler with Whatman's standard 47 mm diameter filter media was used for the determination of Fine Particles (PM<sub>2.5</sub>). PM<sub>2.5</sub> is a measure of particulate matter having size <2.5 microns. APM 550 Fine Particle Sampler is based on impactor designs standardized by USEPA for ambient air quality monitoring.

Ambient air laden with suspended particulates enters the Respirable Dust Sampler (RDS) through the inlet pipe of sampler by means of high flow rate blower (1.2 to 1.4 m<sup>3</sup>/min). As the air passes through the cyclone, coarse, non-respirable dust (size > 10 microns) is separated from the air stream by centrifugal forces acting on the solid particles. These separated particles fall through the cyclone's conical hopper and collect in the sampling bottle placed at bottom. The fine dust forming the respirable fraction (size <10 microns) of the Total Suspended Particulates passes through the cyclone and is carried by the air stream to the Glass Micro-fibre Filter Paper. The Respirable Particulate Matter (RPM) is retained by the filter and the carrier air exhausted from the system through the blower. The mass concentration (µg/m<sup>3</sup>) of Respirable Particulate Matter in the ambient air is computed by measuring the mass of collected particulates and the volume of air sampled.

#### **SO<sub>2</sub> (Modified West & Gaeke Spectrophotometer method)**

Ambient air is bubbled at the rate of 0.5 -1.0 l/min in an Impinger containing a scrubbing solution of Sodium-Tetra Chloro Mercurate. The resultant complex is

reacted with P-Rosaniline and Formaldehyde to form coloured Para-Rosaniline methyl sulphuric acid. The absorbance of the solution is measured in a Spectrophotometer at a wavelength of 560nm. The SO<sub>2</sub> is then calculated from standard graph.

#### *NO<sub>2</sub> (Jacob & Hocheiser modified method)*

Ambient air is bubbled at the rate of 0.5-1.0 l/min in an Impinger containing a solution of Sodium Hydroxide and Sodium Arsenate. The resultant Nitrite Ion is reacted with Phosphoric acid, Sulphanilamide and N-ethylene di-amine di-hydro chloride to form a coloured complex. The absorbance is measured in a Spectrophotometer at a wavelength of 540 nm. The concentration of NO<sub>2</sub> is then calculated by using standard graph.

#### **Ozone (Chemical Method)**

The micro amounts of ozone and the oxidants liberate Iodine when absorbed in a 1% solution of potassium iodide buffered at pH 6.8 +/-0.2. The iodine liberated is determined spectrophotometrically by measuring the absorption of tri-iodide ion at 352nm.

#### **Ammonia (Indophenol blue method)**

Ammonia in the air is collected by bubbling a measured volume of air through a dilute solution of sulphuric acid to form ammonium sulphate. The ammonium sulphate thus formed in the sample is analysed colorometrically by reaction with phenol and alkaline sodium hypochlorite to produce indophenol. The reaction is accelerated by the addition of Sodium Nitroprusside catalyst.

#### **Benzene and Benzopyrene**

The method is designed to collect particulate phase PAH in ambient air and fugitive emissions and to determine individual PAH compounds using capillary gas chromatography equipped with flame ionization detector.

#### **Heavy metals**

The AAS technique makes use of absorption spectrophotometry to assess the concentration of metals in the sample. The method is based on active sampling using PM<sub>10</sub> high volume sampler and then sample analysis is done by Atomic absorption spectrophotometer. The methodology adopted are given as follows:

| S.No. | Parameters             | Methodology                                       |
|-------|------------------------|---|
| 1     | Particulate Matter <10 | Respirable dust sampling and gravimetric analysis |
| 2     | PM2.5                  | Gravimetric method                                |
| 3     | Sulphur di-oxide       | Improved West-Gaeke-Spectrophotometric Method     |
| 4     | Oxide of Nitrogen      | Jacob and Hocheiser Modified Method               |
| 5     | Carbon-monoxide        | Detector method                                   |
| 6     | Ammonia                | Indophenol method                                 |
| 7     | Benzene                | Adsorption and desorption followed by EC          |
| 8     | Benzo-pyrene           | Solvent extraction followed by GC analysis        |
| 9     | Heavy Metals           | AAS method after sampling on EPM Filter paper     |

## 2.4 Water quality

Water samples were collected and analyzed as per procedures outlined in IS-2488/ IS-3025 / AWWA / APHA. Sterilized bottles were used for collection of water sample for bacteriological analysis, stored in icebox and transported to the laboratory for the analysis. Parameters like pH, Temperature, Dissolved Oxygen, Residual Chlorine, Conductivity, Free Ammonia, Total Hardness, Calcium Hardness and Magnesium Hardness were analyzed in the field while collecting the samples. MPN index of Coliforms are determined in the laboratory as per standard methods.

The analytical techniques used for water and wastewater analysis is given in the Table-2.1.

**TABLE-2.1**  
**ANALYTICAL TECHNIQUES FOR WATER AND WASTEWATER ANALYSIS**

| Parameter               | Method           |
|-------------------------|------------------|
| pH                      | APHA-4500-H+     |
| Colour                  | APHA-2120 C      |
| Odour                   | IS: 3025, Part-4 |
| Temperature             | APHA-2550 B      |
| Dissolved Oxygen        | APHA-4500 O      |
| BOD                     | APHA-5210 B      |
| Electrical conductivity | APHA-2510 B      |

| Parameter              | Method                                 |
|------------------------|--|
| Turbidity              | APHA-2130 B                            |
| Chlorides              | APHA-4500 Cl-                          |
| Fluorides              | APHA-4500 F-                           |
| Total dissolved solids | APHA-2540 C                            |
| Total suspended solids | APHA-2540 D                            |
| Total hardness         | APHA-2340 C                            |
| Sulphates              | APHA-4500 SO <sub>4</sub> -2           |
| Arsenic                | APHA-3120 B/ APHA-3114 B/ APHA-3500 As |
| Calcium                | APHA-3120 B/ APHA-3500 Ca              |
| Magnesium              | APHA-3120 B/ APHA-3500 Mg              |
| Sodium                 | APHA-3120 B/ APHA-3500 Na              |
| Potassium              | APHA-3120 B/ APHA-3500 K               |
| Manganese              | APHA-3120 B/ APHA-3500 Mn              |
| Mercury                | APHA-3112 B/ APHA-3500 Hg              |
| Selenium               | APHA-3120 B/ APHA-3114 B/ APHA-3500 Se |
| Lead                   | APHA-3120 B/ APHA-3500 Pb              |
| Copper                 | APHA-3120 B/ APHA-3500 Cu              |
| Cadmium                | APHA-3120 B/ APHA-3500 Cd              |
| Iron                   | APHA-3120 B/ APHA-3500 Fe              |
| Zinc                   | APHA-3120 B/ APHA-3500 Zn              |
| Boron                  | APHA-4500 B                            |
| Coliform organisms     | APHA-9215 D                            |
| Alkalinity             | APHA-2320 B                            |

## 2.5 Noise levels

Ambient noise level measurements in four co-ordinal directions were carried out using CYGNET sound level meter, with windscreen during daytime as well as night time.

Noise measurements were made at 1.5 m above ground and about 3m away from walls, buildings or other sound reflecting sources. The readings were taken at an interval of one minute for 30 minutes and mean Leq. values has been reported. Ambient noise levels are compared with Air quality standards in respect of noise for residential area.

## 2.6 Soil quality

To assess the baseline soil quality, soil samples were collected from identified locations in core & buffer zones using augers at depths 30, 60 and 100 cms. The samples were analyzed for chemical parameters like pH, EC, N, P, K and engineering parameters like textural class, bulk density, liquid limit, field capacity, wilting coefficient and available water storage capacity.

### 3.0 MICROMETEOROLOGICAL STATUS

#### 3.1 Rationale behind sampling

Meteorological parameters are important factors in the study of air pollution. The transport and diffusion of the pollutants in the atmosphere are governed by meteorological factors. Factors like wind velocity, wind direction and atmospheric stability are known as primary / basic meteorological parameters since the dispersion and diffusion of pollutants depend mainly on these factors. Factors like ambient temperature, humidity, rainfall, atmospheric pressure, etc., are known as secondary meteorological parameters as these factors control the dispersion of the pollutants indirectly by affecting the primary factors. Thus, to assess the air pollution impact it becomes essential to collect the above-mentioned meteorological parameters in the project area.

Micrometeorological and microclimatic parameters were recorded by installing a meteorology station in Corezone as it represents the prevailing micrometeorological aspects of the study area. During the study period, hourly reading of wind velocity, wind direction, temperature, humidity, cloud cover etc., were recorded and reported. Further daily rainfall has been recorded and reported.

#### 3.2 Data presentation & analysis

The micrometeorological data thus collected has been processed and analyzed as per standard procedures. The seasonal wind distribution is given in the Table - 3.1. The meteorology status is furnished in Table - 3.2. The daily abstract, micrometeorology data and daily windrose are given in **Annexure I**. The seasonal & daytime and nighttime windroses are given in fig. III.1 & III.2.

Baseline environmental data generation for Orient UGP – Summer 2012

**Table – 3.1 :**

**Seasonal wind distribution data**

Project : Orient UGP

Season : Summer 2012

Location : Core-zone

| Wind Direction<br>(from) | Wind Velocity ( % Duration ) |       |        |         |
|--------------------------|------------------------------|-------|--------|---------|
|                          | < 1                          | 1 - 5 | 5 – 11 | 11 – 19 |
| N                        | 15.9                         | 0.3   | 0.15   | 0       |
| NNE                      |                              | 0.6   | 0.1    | 0.1     |
| NE                       |                              | 1.75  | 0.2    | 0.05    |
| ENE                      |                              | 1.5   | 0.1    | 0       |
| E                        |                              | 1.1   | 0.3    | 0       |
| ESE                      |                              | 2     | 0      | 0       |
| SE                       |                              | 4.2   | 0.6    | 0.1     |
| SSE                      |                              | 3.55  | 0.3    | 0.05    |
| S                        |                              | 6.3   | 0.9    | 0.1     |
| SW                       |                              | 15.2  | 1.8    | 0.25    |
| SSW                      |                              | 21.75 | 1.8    | 0.15    |
| WSW                      |                              | 7.2   | 1.5    | 0.05    |
| W                        |                              | 0     | 0      | 0       |
| WNW                      |                              | 1.25  | 0.2    | 0       |
| NW                       |                              | 7.2   | 0.15   | 0       |
| NNW                      |                              | 0.9   | 0.35   | 0       |
| Season                   | 15.9                         | 74.8  | 8.45   | 0.85    |

The following is the summary of the analysis of the micrometeorological data collected at Orient OCP.

**Table - 3.2 : Meteorology status**

| <b>Meteorology station : Core Zone</b>   |   |
|--|---|
| <b>Climatic conditions</b>               | <b>Summer season<br/>(05<sup>th</sup> March - 26<sup>th</sup> May 2012)</b> |
| Predominant wind direction (from)        | <b>South West</b>   |
| Predominant prevailing wind range (Kmph) | 1 - 5   |
| Wind speed (m/sec)                       |   |
| i) Minimum                               | < 1.0   |
| ii) Maximum                              | 18.8  |
| Temperature (°C)                         |   |
| i) Minimum                               | 20.5  |
| ii) Maximum                              | 44.0  |
| Relative humidity (%)                    |   |
| i) Minimum                               | 28.0  |
| ii) Maximum                              | 88.0  |
| Total rainfall (cm)                      | -   |

## Seasonal Windrose

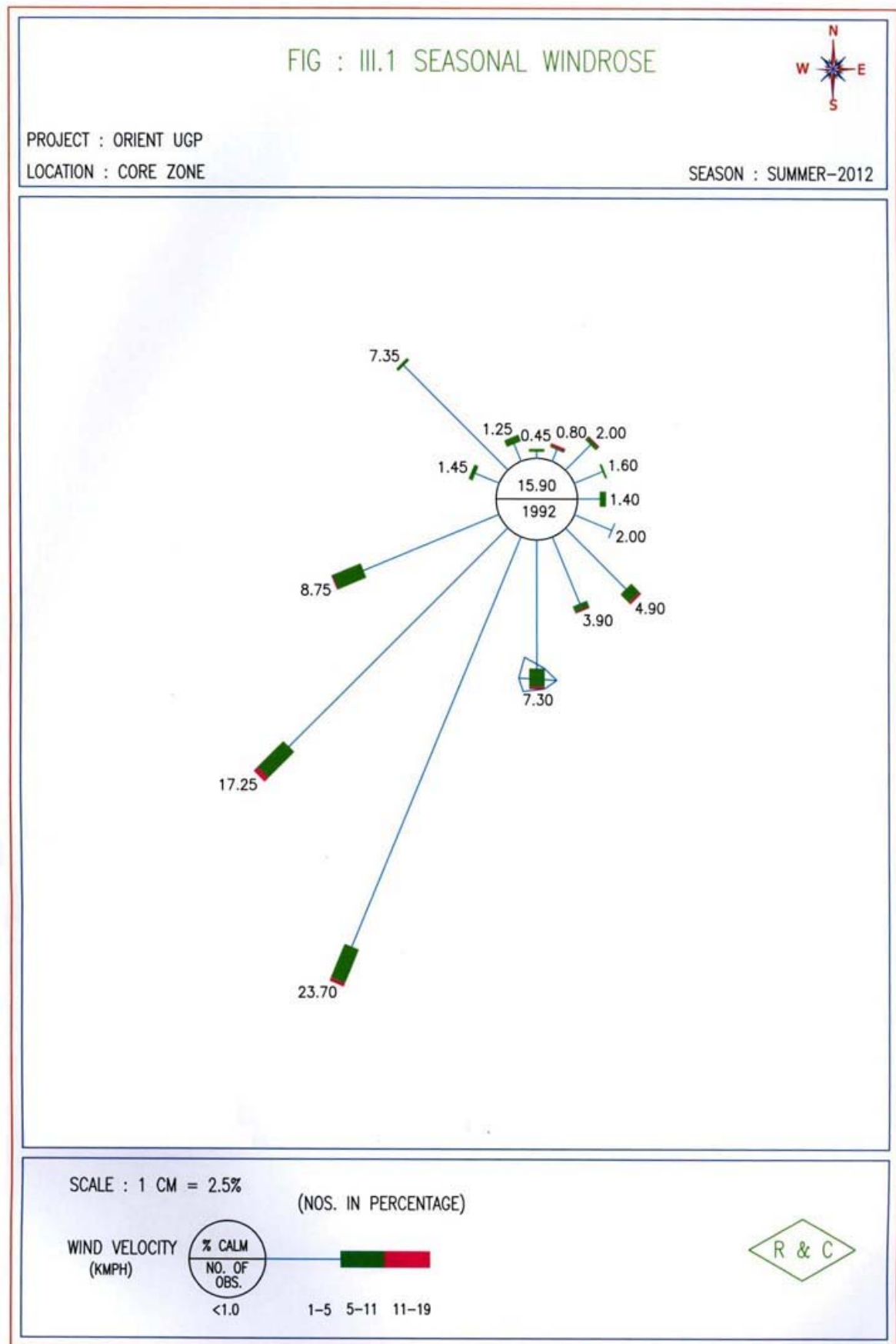


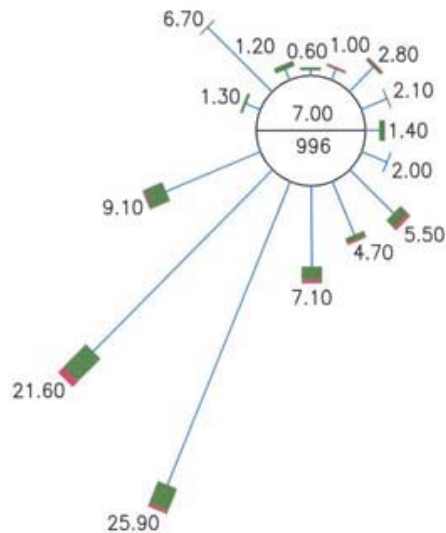
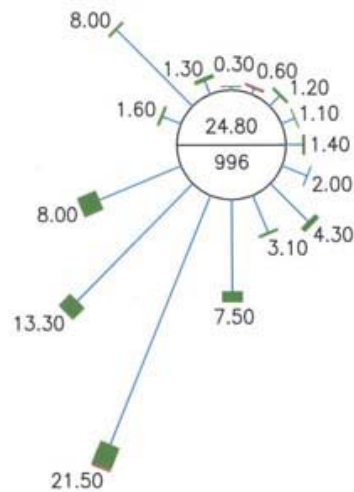
FIG : III.2 DAY TIME &amp; NIGHT TIME WINDROSES



PROJECT : ORIENT UGP

LOCATION : CORE ZONE

SEASON : SUMMER-2012

DAY TIMETIME: 06.00hrs. TO 18.00hrs.NIGHT TIMETIME: 18.00hrs. TO 06.00hrs.

SCALE : 1 CM = 5%

(NOS. IN PERCENTAGE)

WIND VELOCITY  
(KMPH)

1-5 5-11 11-19

R &amp; C

## 4.0 AMBIENT AIR QUALITY STATUS

### 4.1 Preamble

The principle objective of the ambient air quality monitoring is to assess the existing levels of air pollutants as well as the regional background concentration in and around the project area. Air pollution forms an important and critical factor to study the environmental issues in the mining areas. Air quality has to be frequently monitored to know the extent of pollution due to mining and allied activities. The ambient air quality monitoring was carried out at eight stations.

The monitoring stations were identified on the basis of meteorology in the upwind and downwind direction as well as to represent the cross sectional scenario of the project site. The monitoring network was designed based on the available meteorological and climatologically norms of predominant wind direction and wind speed of the study region.

The parameters selected for analyzing the air quality status are Particulate Matter <10 & 2.5 , Sulphur dioxide (SO<sub>2</sub>), Nitrogen oxides (NO<sub>x</sub>), Ammonia (NH<sub>3</sub>), Ozone (O<sub>3</sub>), BaP, Heavy Metals. As per the existing norms, air quality monitoring was carried out on 24 hourly basis for SPM & RPM ,SO<sub>2</sub> and NO<sub>x</sub> samples for two days in a week for twelve weeks in the season. The location details of ambient air quality monitoring stations are given in the Table - 4.1 and are shown in the Fig.(Appendix)

**Table - 4.1 Details of Ambient air quality monitoring stations  
(Location & Bearing)**

| Sl. No. | Location Name           | Location Code | Direction (from Site) | Distance (Km) |
|---------|-------------------------|---------------|-----------------------|---------------|
| 1.      | Corezone (Store)        | A1            | -                     | -             |
| 2.      | Core zone (Near Temple) | A2            | -                     | -             |
| 3.      | Mandlia                 | A3            | E                     | 0.8           |
| 4.      | Gandghora               | A4            | NE                    | 1.5           |
| 5.      | Gandhi Chowk            | A5            | NNE                   | 1.6           |
| 6.      | Chheikuthi              | A6            | N                     | 1.4           |
| 7.      | Jamkani                 | A7            | SW                    | 1.4           |
| 8.      | Lajkura                 | A8            | S                     | 0.8           |

## 4.2 Rationale behind sampling

(i) **Corezone (A1 & A2)** : This location is selected to assess the increase in pollution levels due to the ongoing mining operation through post project monitoring.

(ii) **Mandlia (A3)**: This location is situated at 0.8 km distance from the mine towards E direction. The data will help to know the extent of pollution, if any, due to mining operations in nearby area and to assess baseline status in the downwind direction.

(iii) **Ganddhora (A4)**: This location is situated at 1.5 km distance from the mine towards North-East direction and it was selected for air quality monitoring to assess baseline status in the downwind direction.

(iv) **Gandhi Chowk (A5)**: This location is situated about 1.6 km distance from site towards North-North East direction and it was selected for air quality monitoring to assess baseline status in the nearby area.

(v) **Chheikuthi (A6)**: This location is situated at a distance of 1.4 km towards North of operating mine area. It was selected to assess the impact of air pollutants due to nearby mining and to know the baseline air quality status of this area.

(vi) **Jamkani (A7)**: This location is situated at a distance of 1.4 km towards SW direction of operating mine area and it was selected for air quality monitoring to assess baseline status in the upwind direction.

(vi) **Lajkura (A8)**: This location is situated at a distance of 0.8 km towards south direction of operating mine area and it was selected for air quality monitoring to assess baseline status in the upwind direction.

## 4.3 Data presentation & analysis

The ambient air quality data collected are furnished in **Annexure-II** and the abstract of the same is given in the Table - 4.2.

**Table – 4.2 Ambient Air Quality Status**(All units in  $\mu\text{g}/\text{m}^3$ )

| (All units in µg/m <sup>3</sup> ) |      |                       |      |       |       |         |            |
|-----------------------------------|------|-----------------------|------|-------|-------|---------|------------|
| Location name & code              | Min  | 98 <sup>th</sup> Per. | Max  | AM    | GM    | Std.dev | CPCB Limit |
| PM10                              |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 64   | 94                    | 94   | 84.0  | 83.8  | 6.1     | 100        |
| Core zone (Near Temple) (A2)      | 89   | 115                   | 115  | 100.9 | 100.7 | 6.8     |            |
| Mandlia (A3)                      | 66   | 82                    | 82   | 75.9  | 75.8  | 4.3     |            |
| Gandghora (A4)                    | 65   | 77                    | 77   | 71.0  | 70.9  | 3.8     |            |
| Gandhi Chowk (A5)                 | 68   | 81                    | 81   | 73.8  | 73.7  | 3.6     |            |
| Chheikuthi (A6)                   | 58   | 84                    | 84   | 71.6  | 71.2  | 8.2     |            |
| Jamkani (A7)                      | 52   | 62                    | 62   | 49.8  | 49.5  | 5.8     |            |
| Lajkura (A8)                      | 50   | 70                    | 70   | 58.3  | 58.0  | 5.6     |            |
| PM2.5                             |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 19   | 28                    | 28   | 25.2  | 25.1  | 1.9     | 60         |
| Core zone (Near Temple) (A2)      | 28   | 37                    | 37   | 32.3  | 32.3  | 2.2     |            |
| Mandlia (A3)                      | 23   | 29                    | 29   | 26.5  | 26.5  | 1.5     |            |
| Gandghora (A4)                    | 23   | 27                    | 27   | 24.9  | 24.9  | 1.4     |            |
| Gandhi Chowk (A5)                 | 26   | 31                    | 31   | 28.0  | 28.0  | 1.3     |            |
| Chheikuthi (A6)                   | 20   | 29                    | 29   | 24.4  | 24.2  | 2.9     |            |
| Jamkani (A7)                      | 14   | 21                    | 21   | 16.9  | 16.8  | 2.0     |            |
| Lajkura (A8)                      | 17   | 24                    | 24   | 19.8  | 19.7  | 1.9     |            |
| SO <sub>2</sub>                   |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 11.0 | 17.0                  | 17.0 | 13.9  | 13.8  | 1.6     | 80         |
| Core zone (Near Temple) (A2)      | 13.7 | 16.6                  | 16.6 | 15.4  | 15.4  | 0.7     |            |
| Mandlia (A3)                      | 14.2 | 16.0                  | 16.0 | 15.0  | 15.0  | 0.5     |            |
| Gandghora (A4)                    | 17.6 | 20.4                  | 20.4 | 18.7  | 18.7  | 0.9     |            |
| Gandhi Chowk (A5)                 | 14.0 | 16.8                  | 16.8 | 15.1  | 15.1  | 0.9     |            |
| Chheikuthi (A6)                   | 10.6 | 13.8                  | 13.8 | 11.7  | 11.7  | 0.9     |            |
| Jamkani (A7)                      | 10.0 | 13.1                  | 13.1 | 11.4  | 11.4  | 0.8     |            |
| Lajkura (A8)                      | 10.3 | 13.7                  | 13.7 | 11.4  | 11.3  | 0.8     |            |
| NO <sub>x</sub>                   |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 12.9 | 24.6                  | 24.6 | 17.4  | 17.0  | 4.1     | 80         |
| Core zone (Near Temple) (A2)      | 14.8 | 19.5                  | 19.5 | 17.8  | 17.8  | 1.3     |            |
| Mandlia (A3)                      | 17.6 | 20.3                  | 20.3 | 19.0  | 19.0  | 0.8     |            |
| Gandghora (A4)                    | 17.0 | 19.5                  | 19.5 | 18.3  | 18.3  | 0.7     |            |
| Gandhi Chowk (A5)                 | 16.9 | 19.4                  | 19.4 | 18.2  | 18.2  | 0.7     |            |
| Chheikuthi (A6)                   | 16.2 | 19.3                  | 19.3 | 17.7  | 17.7  | 0.9     |            |
| Jamkani (A7)                      | 13.3 | 16.7                  | 16.7 | 14.8  | 14.7  | 1.0     |            |
| Lajkura (A8)                      | 16.5 | 19.9                  | 19.9 | 18.0  | 18.0  | 1.0     |            |
| NH <sub>3</sub>                   |      |                       |      |       |       |         |            |
| Corezone (Store) (A1)             | 13   | 26                    | 26   | 19.0  | 18.7  | 3.5     | 400        |
| Core zone (Near Temple) (A2)      | 10   | 20                    | 20   | 14.5  | 14.3  | 2.7     |            |
| Mandlia (A3)                      | 14   | 25                    | 25   | 20.2  | 19.9  | 3.1     |            |
| Gandghora (A4)                    | 14   | 25                    | 25   | 18.6  | 18.4  | 2.9     |            |
| Gandhi Chowk (A5)                 | 16   | 25                    | 25   | 20.3  | 20.2  | 2.2     |            |
| Chheikuthi (A6)                   | 20   | 28                    | 28   | 23.6  | 23.5  | 2.2     |            |
| Jamkani (A7)                      | 11   | 20                    | 20   | 15.3  | 15.1  | 2.3     |            |
| Lajkura (A8)                      | 13   | 22                    | 22   | 17.3  | 17.1  | 2.3     |            |

Note : All CO, Benzene and BaP values were found to be BDL.

**Core zone**

PM10 and PM2.5 values are ranging from 64  $\mu\text{g}/\text{m}^3$  to 115  $\mu\text{g}/\text{m}^3$  and 19  $\mu\text{g}/\text{m}^3$  to 37  $\mu\text{g}/\text{m}^3$  respectively.  $\text{SO}_2$  and  $\text{NO}_x$  values are varying between 11.0 to 17.0  $\mu\text{g}/\text{m}^3$  and 12.9 to 24.6  $\mu\text{g}/\text{m}^3$  respectively. The ammonia was found to be maximum extent of 26  $\mu\text{g}/\text{m}^3$ . *All the values are found to be within the CPCB Standards except  $\text{PM}_{10}$ .*

**Buffer zone**

PM10 and PM2.5 values are ranging from 42  $\mu\text{g}/\text{m}^3$  to 84  $\mu\text{g}/\text{m}^3$  and 14  $\mu\text{g}/\text{m}^3$  to 31  $\mu\text{g}/\text{m}^3$  respectively.  $\text{SO}_2$  and  $\text{NO}_x$  values are varying between 10.0 to 20.4  $\mu\text{g}/\text{m}^3$  and 8.6 to 12.7  $\mu\text{g}/\text{m}^3$  respectively. The ammonia was found to be maximum extent of 28  $\mu\text{g}/\text{m}^3$ . *All the values are found to be within the CPCB Standards.*

**4.4 Summary**

In general, all values are found to be well within the prescribed limits of CPCB except PM10 in core zone area.

## 5.0 WATER QUALITY STATUS

### 5.1 Rationale behind sampling

Any adverse impact or pollution consequence of water will have serious effect on the environment. Hence, it becomes important to assess the water quality periodically in the mining area. Thus, to assess the water quality, nine locations are identified and samples (9 Nos.) were collected and analysed for physico-chemical and heavy metal parameters. Bacterial examination was also carried out to find out the Coliform contamination (if any) at water sources. The water quality assessment has been made from the following monitoring stations and are shown in Fig. I (Appendix).

- Mine discharge - Orient UGP - W1
- Nalla near Core zone - W2
- Pond Water, Bundia village - W3
- IB River U/S - W4
- IB river D/S - W5
- Tube well, Brajrajnagar - W6
- Tube well, Juribaga village - W7
- Dugwell, Katapalli village - W8
- Dugwell, Belpahar village - W9

### 5.2 Data presentation & analysis

The detailed water quality data generated are given in Annexure III. The abstract of water quality status is furnished in Table 5.1 - 5.3.

Table - 5.1(a) Waste water quality status

| Source         | pH      | Suspended Solids (mg/l) | BOD (mg/l) | COD (mg/l) |
|----------------|---------|-------------------------|------------|------------|
| Mine discharge | 8.08    | 38                      | 8          | 52         |
| GSR 422E Norms | 5.5-9.0 | 100                     | 30         | 250        |

Table - 5.2 Water quality status

| Source                  | pH      |      | Turbidity (NTU) | TDS (mg/l) |     | Total Hardness (mg/l) |     | Iron (mg/l) |      | Chloride (mg/l) |     | Sulphate (mg/l) |     | Fluoride (mg/l) |      |
|-------------------------|---------|------|-----------------|------------|-----|-----------------------|-----|-------------|------|-----------------|-----|-----------------|-----|-----------------|------|
|                         | Min     | Max  |                 | Min        | Max | Min                   | Max | Min         | Max  | Min             | Max | Min             | Max | Min             | Max  |
| Drinking / Ground Water | 7.25    | 7.88 | 5               | 310        | 410 | 154                   | 182 | 0.08        | 0.12 | 40              | 88  | 14              | 24  | 0.09            | 0.01 |
| IS 10500 Norms          | 6.5-8.5 |      | 10              | 500-2000   |     | 300-600               |     | 0.3-1.0     |      | 250-1000        |     | 200-1000        |     | 1.0             |      |

Table - 5.3 Surface water quality status

| Source       | pH      |      | Colour<br>(Hazen<br>Units ) |     | TDS (mg/l) |     | Iron (mg/l) |      | Chloride<br>(mg/l) |     | Sulphate<br>(mg/l) |     | Fluoride (mg/l) |      |
|--------------|---------|------|-----------------------------|-----|------------|-----|-------------|------|--------------------|-----|--------------------|-----|-----------------|------|
|              | Min     | Max  | Min                         | Max | Min        | Max | Min         | Max  | Min                | Max | Min                | Max | Min             | Max  |
| River        | 7.14    | 7.96 | 5                           | 18  | 254        | 612 | 0.09        | 0.24 | 54                 | 174 | 14                 | 68  | 0.10            | 0.30 |
| IS:2296-1982 | 6.5-8.5 |      | 300                         |     | 1500       |     | 50          |      | 600                |     | 400                |     | 1.5             |      |

### 5.3 Summary

At all locations, Oil and grease, phenolic compounds, cyanides, sulphides and insecticides are found to be absent and all heavy metal values except Iron and Zinc are found to be below the detectable limit. In general, the water quality at all eight locations are found to be well within the prescribed norms of GSR: 422E, IS: 10500 - 1991 and IS: 2296 - 1982.

## 6.0 NOISE LEVEL STATUS

### 6.1 Rationale behind sampling

To know the background ambient noise level at the operating Orient UGP and surrounding environment, 8 locations (two in core zone and six in buffer zone) were identified for baseline study.

The noise level monitoring stations are given below and are shown in Fig. (Appendix) and given in Table 6.1.

TABLE - 6.1  
AMBIENT NOISE LEVEL MONITORING STATIONS

| Sl. No. | Location Name           | Location Code |
|---------|-------------------------|---------------|
| 1.      | Corezone (Store)        | N1            |
| 2.      | Core zone (Near Temple) | N2            |
| 3.      | Mandlia                 | N3            |
| 4.      | Gandghora               | N4            |
| 5.      | Gandhi Chowk            | N5            |
| 6.      | Chheikuthi              | N6            |
| 7.      | Jamkani                 | N7            |
| 8.      | Lajkura                 | N8            |

### 6.2 Data presentation & analysis

The generated noise level data are given in Annexure-IV and the abstract is furnished in Tables - 6.2.

Table - 6.2: Noise level status

| S.No. | Zone        | Noise level (dB(A)) |             | Noise level Standards |           |
|-------|-------------|---------------------|-------------|-----------------------|-----------|
|       |             | Daytime             | Nighttime   | Daytime               | Nighttime |
| 1.    | Core zone   | 52.9 - 60.2         | 50.5 - 56.4 | 75                    | 70        |
| 2.    | Buffer zone | 40.5 - 48.7         | 35.8 - 43.2 | 55                    | 45        |

Mean  $L_{eq}$  noise levels at day time and night time are ranging from 41.0 to 60.0 dB(A) and 35.8 to 57.6 dB(A) respectively in the study area. While comparing with IS: 4954 -1986 norms for acceptable outdoor noise levels in residential area, these values are found to be within the limits.

### 6.3 Summary

While comparing with IS: 4954 -1986 norms for acceptable outdoor noise levels in residential area, the  $L_{eq}$  values are found to be within the limits.

## 7.0 SOIL QUALITY

### 7.1 Rationale behind sampling

Soil characteristics, erosion aspects, soil fertility etc., have direct bearing on the environment. Knowledge of soil parameters is essential for the planning and implementation of afforestation. Further, major mining activities affect the soil regime of the surrounding areas directly or indirectly. Hence, it becomes important to study the soil characteristics.

By keeping the above aspects in view, five locations are selected in the core and buffer zone. Locations are selected in such a way that different type of soils for supporting different species of vegetation are covered. The soil quality monitoring stations are furnished below and are shown in Fig.(Appendix).

|                                     |   |                |
|-------------------------------------|---|----------------|
| Forest Land, Corezone               | - | S <sub>1</sub> |
| Barren Land, Corezone               | - | S <sub>2</sub> |
| Barren Land, Near Corezone          | - | S <sub>3</sub> |
| Agricultural Land, Bundia village   | - | S <sub>4</sub> |
| Agricultural Land, Gangapur village | - | S <sub>5</sub> |

### 7.2 Data presentation & analysis

The soil quality data collected are given in **Annexure - V** and status of the soil quality is furnished in Table - 7.1.

*Table - 7.1 Soil quality status*

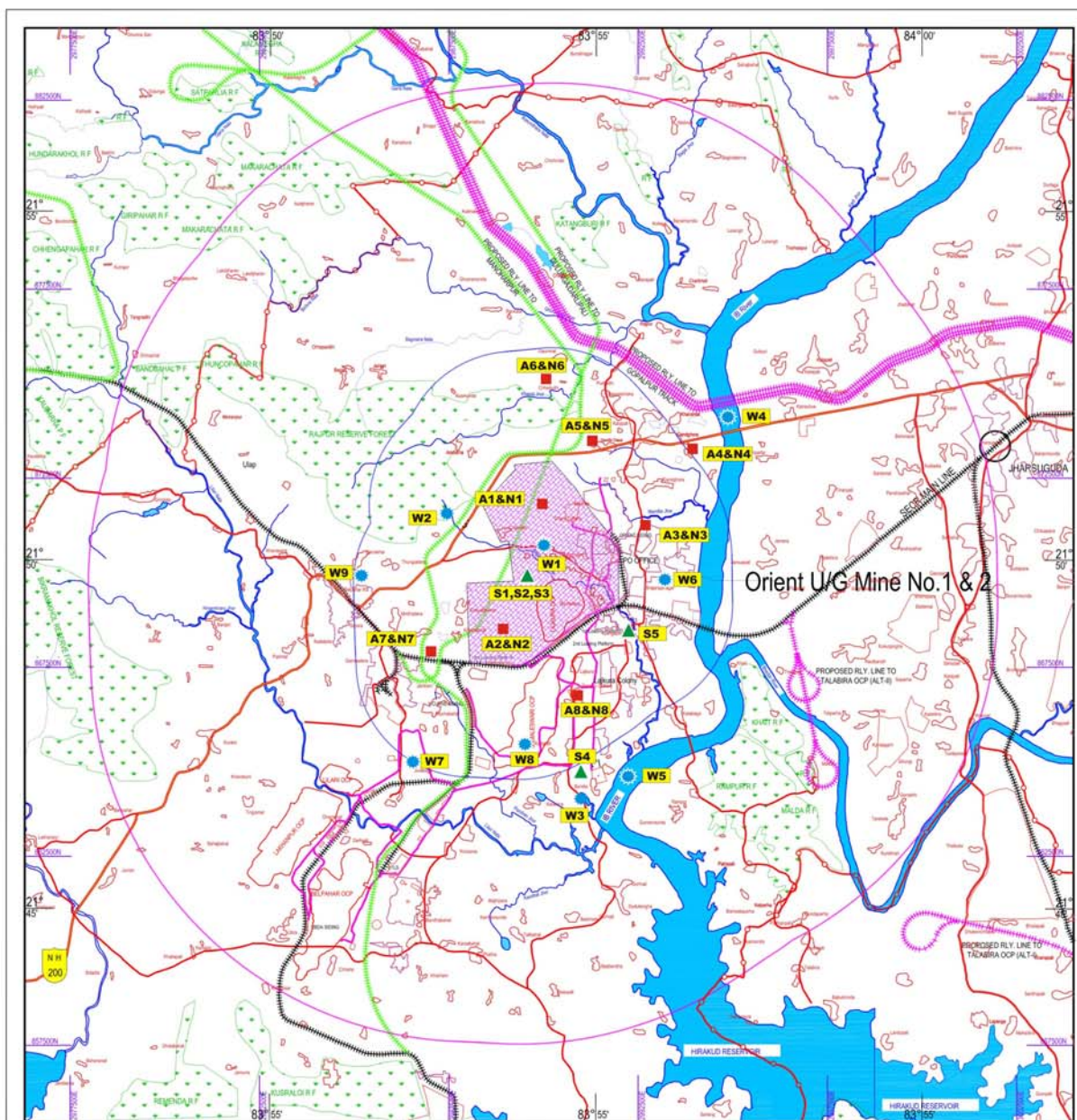
| S.No. | Parameters                  | Range of Concentration |
|-------|-----------------------------|------------------------|
| 1     | pH                          | 7.04 - 7.62            |
| 2.    | Organic Carbon (%)          | 0.3 - 4.6              |
| 3.    | Potassium (kg/ha)           | 110 - 164              |
| 4.    | Nitrogen (Kg/ha)            | 59.4 - 458             |
| 5.    | Available magnesium (Kg/Ha) | 94 - 422               |
| 6.    | Texture Class               | Sandy Loam             |

### 7.3 Summary

The soil quality in the project area appears to be good and would support after suitable reclamation measures.

## APPENDIX

### LOCATION MAP OF ENVIRONMENTAL MONITORING STATIONS



#### ■ Ambient Air Quality & Noise Level Monitoring Stations

- A1&N1 - Core Zone, Store
- A2&N2 - Core Zone, Near Temple
- A3&N3 - Mandlia village
- A4&N4 - Gandghora village
- A5&N5 - Gandhi chowk
- A6&N6 - Chheikuthi village
- A7&N7 - Jamkani village
- A8&N8 - Lajkura village

#### ★ Water Quality Monitoring Stations

- W1 - Mine discharge
- W2 - Nalla, near Corezone
- W3 - Pond Water, Bundia village
- W4 - IB river U/S
- W5 - IB river D/S
- W6 - Tube well, Brajrajnagar
- W7 - Tubewell, Juriabag village
- W8 - Dugwell, Katpali village
- W9 - Dugwell, Belpahar village

#### ▲ Soil Quality Monitoring Stations

- S1 - Forest Land, Corezone
- S2 - Barren Land, Corezone
- S3 - Barren Land, Corezone
- S4 - Agri. Land, Bundia village
- S5 - Agri. Land, Gangapur village

Baseline Environmental Data Generation for Summer 2012



TABLE NO : 3.1 ABSTRACT OF METEOROLOGICAL DATA

Project : Orient UGP  
Season : Summer Season ` 2012

Location : Core-zone  
Month : 5<sup>th</sup> March ` 12 to 26<sup>th</sup> May ` 12

| Date        | Wind Velocity (kmph) |      |     | Predominant<br>Wind Direction<br>(From) | Temperature (°C) |      |      | Relative Humidity (%)<br>Average |     |      | Atm. Pr.<br>(mm / Hg) | Rainfall<br>(mm) | Sky<br>Appearance |
|-------------|----------------------|------|-----|---|------------------|------|------|----------------------------------|-----|------|-----------------------|------------------|-------------------|
|             | Min                  | Max  | Avg |   | Min              | Max  | Avg  | Min                              | Max | Avg  |                       |                  |                   |
| 05/06.03.12 | <1.0                 | 5.3  | 1.7 | SW                                      | 22.0             | 38.5 | 30.2 | 48                               | 82  | 63.6 | 750                   | 0                | Clear             |
| 06/07.03.12 | <1.0                 | 9.8  | 3.0 | SW                                      | 23.5             | 36.5 | 29.9 | 49                               | 81  | 66.4 | 750                   | 0                | Clear             |
| 07/08.03.12 | <1.0                 | 6.3  | 2.4 | SW                                      | 25.0             | 37.0 | 30.9 | 49                               | 81  | 67.7 | 750                   | 0                | Clear             |
| 08/09.03.12 | <1.0                 | 7.8  | 2.7 | SW                                      | 22.0             | 36.5 | 29.8 | 43                               | 80  | 65.3 | 750                   | 0                | Clear             |
| 09/10.03.12 | <1.0                 | 14.2 | 4.4 | SSW                                     | 24.5             | 38.5 | 30.5 | 42                               | 82  | 63.2 | 750                   | 0                | Clear             |
| 10/11.03.12 | <1.0                 | 15.2 | 4.4 | SW                                      | 24.0             | 36.5 | 30.0 | 44                               | 86  | 62.2 | 750                   | 0                | Clear             |
| 11/12.03.12 | <1.0                 | 7.2  | 2.5 | SE                                      | 23.5             | 36.5 | 29.9 | 49                               | 82  | 67.9 | 750                   | 0                | Clear             |
| 12/13.03.12 | <1.0                 | 9.8  | 2.4 | SE                                      | 23.0             | 38.5 | 30.4 | 42                               | 82  | 63.0 | 750                   | 0                | Clear             |
| 13/14.03.12 | <1.0                 | 9.9  | 3.5 | SE                                      | 23.5             | 36.5 | 29.9 | 44                               | 79  | 61.8 | 750                   | 0                | Clear             |
| 14/15.03.12 | <1.0                 | 10.3 | 3.4 | SW                                      | 23.0             | 36.5 | 29.8 | 44                               | 80  | 64.6 | 750                   | 0                | Clear             |
| 15/16.03.12 | <1.0                 | 6.9  | 2.4 | SW                                      | 24.5             | 38.0 | 30.4 | 42                               | 80  | 62.8 | 750                   | 0                | Cloudy            |
| 16/17.03.12 | <1.0                 | 8.0  | 2.8 | SW                                      | 24.0             | 36.5 | 30.0 | 43                               | 80  | 61.7 | 750                   | 0                | Clear             |
| 17/18.03.12 | <1.0                 | 7.8  | 2.4 | SE                                      | 24.0             | 36.5 | 30.0 | 42                               | 81  | 61.3 | 750                   | 0                | Clear             |
| 18/19.03.12 | <1.0                 | 8.2  | 2.1 | SW                                      | 23.5             | 36.5 | 29.8 | 38                               | 76  | 54.5 | 750                   | 0                | Clear             |
| 19/20.03.12 | <1.0                 | 9.8  | 2.3 | SW                                      | 23.5             | 36.5 | 29.2 | 36                               | 75  | 54.0 | 750                   | 0                | Clear             |
| 20/21.03.12 | <1.0                 | 17.1 | 2.8 | SE                                      | 23.0             | 36.0 | 27.5 | 41                               | 73  | 56.8 | 750                   | 0                | Clear             |
| 21/22.03.12 | <1.0                 | 8.5  | 2.5 | SW                                      | 22.0             | 36.5 | 28.3 | 45                               | 81  | 64.2 | 750                   | 0                | Clear             |
| 22/23.03.12 | <1.0                 | 10.3 | 2.9 | SW                                      | 22.0             | 38.5 | 29.9 | 40                               | 79  | 60.9 | 750                   | 0                | Clear             |
| 23/24.03.12 | <1.0                 | 10.1 | 2.4 | SW                                      | 22.0             | 38.5 | 28.8 | 43                               | 74  | 59.3 | 750                   | 0                | Clear             |
| 24/25.03.12 | <1.0                 | 8.7  | 2.3 | S                                       | 22.5             | 38.0 | 28.5 | 43                               | 74  | 60.3 | 750                   | 0                | Clear             |
| 25/26.03.12 | <1.0                 | 12.6 | 2.6 | SW                                      | 22.5             | 38.5 | 28.4 | 43                               | 74  | 59.4 | 750                   | 0                | Clear             |
| 26/27.03.12 | <1.0                 | 10.5 | 2.2 | SSW                                     | 22.5             | 38.0 | 30.3 | 40                               | 76  | 60.3 | 750                   | 0                | Clear             |
| 27/28.03.12 | <1.0                 | 9.6  | 2.3 | SW                                      | 24.0             | 38.5 | 30.4 | 40                               | 76  | 60.5 | 750                   | 0                | Clear             |
| 28/29.03.12 | <1.0                 | 11.5 | 2.6 | SW                                      | 23.5             | 38.5 | 28.5 | 43                               | 76  | 60.2 | 750                   | 0                | Clear             |
| 29/30.03.12 | <1.0                 | 16.1 | 2.4 | SE                                      | 24.0             | 36.5 | 30.0 | 41                               | 74  | 56.5 | 750                   | 0                | Clear             |
| 30/31.03.12 | <1.0                 | 8.1  | 2.9 | SW                                      | 23.5             | 38.5 | 29.9 | 42                               | 75  | 58.3 | 750                   | 0                | Clear             |

## ABSTRACT OF METEOROLOGICAL DATA (Contd.,)

| Date        | Wind Velocity (kmph) |      |     | Predominant<br>Wind Direction<br>(From) | Temperature (°C) |      |      | Relative Humidity (%)<br>Average |     |      | Atm. Pr.<br>(mm / Hg) | Rainfall<br>(mm) | Sky<br>Appearance |
|-------------|----------------------|------|-----|---|------------------|------|------|----------------------------------|-----|------|-----------------------|------------------|-------------------|
|             | Min                  | Max  | Avg |   | Min              | Max  | Avg  | Min                              | Max | Avg  |                       |                  |                   |
| 31/01.04.12 | <1.0                 | 8.6  | 3.7 | SSW                                     | 21.5             | 36.5 | 28.5 | 39                               | 71  | 57.3 | 750                   | 0                | Clear             |
| 01/02.04.12 | <1.0                 | 8.5  | 2.8 | SW                                      | 23.0             | 38.5 | 29.7 | 38                               | 69  | 55.5 | 750                   | 0                | Clear             |
| 02/03.04.12 | <1.0                 | 6.4  | 2.3 | SW                                      | 22.5             | 38.5 | 29.0 | 40                               | 74  | 58.1 | 750                   | 0                | Clear             |
| 03/04.04.12 | <1.0                 | 8.3  | 2.2 | SW                                      | 22.0             | 38.5 | 29.5 | 36                               | 78  | 56.8 | 750                   | 0                | Clear             |
| 04/05.04.12 | <1.0                 | 7.1  | 3.0 | SW                                      | 21.5             | 38.0 | 29.4 | 45                               | 78  | 60.0 | 750                   | 0                | Clear             |
| 05/06.04.12 | 1.3                  | 18.8 | 3.8 | SE                                      | 20.5             | 34.5 | 26.5 | 36                               | 78  | 56.7 | 750                   | 0                | Clear             |
| 06/07.04.12 | <1.0                 | 7.5  | 3.2 | SW                                      | 20.5             | 36.5 | 28.5 | 35                               | 72  | 52.6 | 750                   | 0                | Clear             |
| 07/08.04.12 | <1.0                 | 8.0  | 2.8 | SE                                      | 23.5             | 36.5 | 29.3 | 34                               | 74  | 52.2 | 750                   | 0                | Clear             |
| 08/09.04.12 | <1.0                 | 10.1 | 3.4 | SW                                      | 24.0             | 38.5 | 30.6 | 36                               | 75  | 55.1 | 750                   | 0                | Clear             |
| 09/10.04.12 | <1.0                 | 10.3 | 2.9 | SW                                      | 24.5             | 38.5 | 30.8 | 45                               | 79  | 61.4 | 750                   | 0                | Clear             |
| 10/11.04.12 | 1.0                  | 1.1  | 8.6 | SE                                      | 24.5             | 40.0 | 30.5 | 45                               | 83  | 65.8 | 750                   | 0                | Cloudy            |
| 11/12.04.12 | 1.9                  | 12.1 | 4.7 | SW                                      | 25.5             | 40.5 | 31.3 | 50                               | 88  | 71.2 | 750                   | 0                | Clear             |
| 12/13.04.12 | <1.0                 | 10.2 | 4.4 | SE                                      | 26.5             | 39.0 | 31.4 | 51                               | 87  | 71.5 | 750                   | 0                | Clear             |
| 13/14.04.12 | 1.2                  | 9.8  | 4.3 | S                                       | 26.5             | 40.0 | 31.8 | 50                               | 88  | 67.2 | 751                   | 0                | Clear             |
| 14/15.04.12 | 1.7                  | 8.2  | 4.5 | SE                                      | 25.0             | 42.0 | 31.8 | 40                               | 87  | 31.8 | 751                   | 0                | Clear             |
| 15/16.04.12 | <1.0                 | 6.7  | 2.7 | S                                       | 23.5             | 42.0 | 31.6 | 38                               | 85  | 59.4 | 751                   | 0                | Clear             |
| 16/17.04.12 | 1.6                  | 5.2  | 2.9 | S                                       | 22.5             | 42.0 | 31.1 | 36                               | 82  | 61.2 | 751                   | 0                | Clear             |
| 17/18.04.12 | <1.0                 | 8.1  | 2.8 | S                                       | 22.5             | 44.0 | 32.7 | 33                               | 82  | 56.8 | 751                   | 0                | Clear             |
| 18/19.04.12 | <1.0                 | 5.4  | 2.0 | SSW                                     | 22.5             | 36.0 | 29.3 | 36                               | 85  | 63.6 | 751                   | 0                | Clear             |
| 19/20.04.12 | <1.0                 | 6.5  | 2.3 | SE                                      | 23.0             | 39.0 | 29.5 | 36                               | 82  | 60.0 | 751                   | 0                | Clear             |
| 20/21.04.12 | <1.0                 | 6.7  | 2.4 | NW                                      | 22.5             | 42.0 | 31.5 | 35                               | 79  | 56.8 | 751                   | 0                | Clear             |
| 21/22.04.12 | <1.0                 | 10.6 | 3.9 | SW                                      | 22.5             | 40.0 | 29.7 | 33                               | 80  | 58.4 | 751                   | 0                | Clear             |
| 22/23.04.12 | 1.2                  | 8.3  | 3.7 | SSW                                     | 23.0             | 37.5 | 28.3 | 36                               | 82  | 64.8 | 751                   | 0                | Clear             |
| 23/24.04.12 | 1.2                  | 8.5  | 3.7 | SE                                      | 23.0             | 40.4 | 29.6 | 34                               | 83  | 61.0 | 751                   | 0                | Clear             |
| 24/25.04.12 | 1.1                  | 5.2  | 2.8 | SE                                      | 22.5             | 37.0 | 28.7 | 33                               | 85  | 60.7 | 751                   | 0                | Clear             |
| 25/26.04.12 | 1.3                  | 4.9  | 2.3 | SSW                                     | 22.5             | 40.0 | 30.5 | 34                               | 85  | 62.2 | 751                   | 0                | Clear             |
| 26/27.04.12 | 1.0                  | 3.4  | 1.9 | SSW                                     | 23.0             | 40.0 | 30.5 | 32                               | 83  | 59.6 | 751                   | 0                | Clear             |
| 27/28.04.12 | 1.0                  | 2.6  | 1.7 | E                                       | 23.0             | 38.5 | 28.5 | 36                               | 84  | 65.1 | 751                   | 0                | Clear             |
| 28/29.04.12 | 1.6                  | 4.4  | 3.2 | SW                                      | 23.5             | 40.0 | 29.5 | 34                               | 83  | 61.4 | 751                   | 0                | Clear             |

## ABSTRACT OF METEOROLOGICAL DATA (Contd.,)

| Date        | Wind Velocity (kmph) |      |     | Predominant Wind Direction (From) | Temperature (°C) |      |      | Relative Humidity (%) Average |     |      | Atm. Pr. (mm / Hg) | Rainfall (mm) | Sky Appearance |
|-------------|----------------------|------|-----|-----------------------------------|------------------|------|------|-------------------------------|-----|------|--------------------|---------------|----------------|
|             | Min                  | Max  | Avg |                                   | Min              | Max  | Avg  | Min                           | Max | Avg  |                    |               |                |
| 29/30.04.12 | 3.1                  | 6.9  | 4.8 | SSE                               | 22.5             | 40.0 | 30.5 | 33                            | 80  | 59.1 | 751                | 0             | Clear          |
| 30/01.05.12 | 5.4                  | 9.2  | 7.2 | SE                                | 22.5             | 37.0 | 28.3 | 36                            | 84  | 65.2 | 751                | 0             | Clear          |
| 01/02.05.12 | 2.2                  | 11.2 | 7.3 | S                                 | 22.5             | 39.0 | 29.3 | 33                            | 78  | 57.6 | 751                | 0             | Clear          |
| 02/03.05.12 | 1.7                  | 6.2  | 3.5 | SSW                               | 23.0             | 38.5 | 29.5 | 35                            | 81  | 55.5 | 751                | 0             | Clear          |
| 03/04.05.12 | <1.0                 | 4.5  | 1.8 | SE                                | 23.0             | 40.0 | 29.5 | 33                            | 79  | 56.1 | 751                | 0             | Clear          |
| 04/05.05.12 | 1.2                  | 7.4  | 2.8 | SW                                | 23.5             | 39.5 | 29.5 | 32                            | 78  | 55.2 | 751                | 0             | Clear          |
| 05/06.05.12 | <1.0                 | 5.8  | 2.6 | SSW                               | 22.5             | 40.0 | 29.4 | 33                            | 75  | 55.4 | 751                | 0             | Clear          |
| 06/07.05.12 | 1.1                  | 4.4  | 2.7 | SSE                               | 23.0             | 39.5 | 29.6 | 32                            | 74  | 54.2 | 751                | 0             | Cloudy         |
| 07/08.05.12 | 1.3                  | 7.5  | 3.8 | SW                                | 22.5             | 40.0 | 29.8 | 33                            | 78  | 54.1 | 751                | 0             | Clear          |
| 08/09.05.12 | <1.0                 | 3.6  | 1.6 | SSW                               | 23.0             | 38.5 | 23.4 | 30                            | 75  | 53.2 | 751                | 0             | Clear          |
| 09/10.05.12 | <1.0                 | 4.5  | 2.1 | SW                                | 23.0             | 39.0 | 30.3 | 28                            | 75  | 52.4 | 751                | 0             | Clear          |
| 10/11.05.12 | <1.0                 | 7.7  | 2.8 | S                                 | 22.5             | 40.0 | 29.2 | 29                            | 75  | 55.1 | 751                | 0             | Clear          |
| 11/12.05.12 | <1.0                 | 4.8  | 2.6 | WSW                               | 23.0             | 40.0 | 30.5 | 32                            | 75  | 53.2 | 751                | 0             | Clear          |
| 12/13.05.12 | <1.0                 | 5.5  | 2.6 | SW                                | 23.0             | 40.0 | 29.5 | 31                            | 82  | 58.9 | 751                | 0             | Clear          |
| 13/14.05.12 | <1.0                 | 4.6  | 2.7 | SE                                | 23.5             | 37.5 | 23.3 | 36                            | 81  | 64.7 | 751                | 0             | Clear          |
| 14/15.05.12 | <1.0                 | 9.8  | 4.0 | SE                                | 22.5             | 40.0 | 29.6 | 34                            | 83  | 60.3 | 751                | 0             | Clear          |
| 15/16.05.12 | <1.0                 | 4.8  | 2.8 | SSE                               | 22.0             | 40.0 | 29.6 | 34                            | 81  | 60.6 | 751                | 0             | Clear          |
| 16/17.05.12 | <1.0                 | 4.2  | 1.9 | SSW                               | 23.0             | 39.0 | 29.6 | 28                            | 76  | 57.1 | 751                | 0             | Clear          |
| 17/18.05.12 | <1.0                 | 5.1  | 2.3 | SW                                | 22.5             | 38.0 | 28.3 | 36                            | 78  | 62.3 | 751                | 0             | Clear          |
| 18/19.05.12 | <1.0                 | 2.4  | 1.3 | S                                 | 23.0             | 40.0 | 29.6 | 32                            | 81  | 60.7 | 751                | 0             | Clear          |
| 19/20.05.12 | <1.0                 | 2.8  | 1.6 | SE                                | 22.5             | 38.0 | 28.5 | 33                            | 80  | 60.1 | 751                | 0             | Clear          |
| 20/21.05.12 | <1.0                 | 3.1  | 1.5 | SW                                | 22.5             | 40.0 | 30.0 | 34                            | 79  | 60.1 | 751                | 0             | Clear          |
| 21/22.05.12 | <1.0                 | 3.2  | 1.7 | SW                                | 22.5             | 39.5 | 29.3 | 29                            | 78  | 57.2 | 751                | 0             | Clear          |
| 22/23.05.12 | <1.0                 | 3.4  | 1.8 | SW                                | 22.0             | 38.0 | 28.3 | 36                            | 76  | 61.5 | 751                | 0             | Clear          |
| 23/24.05.12 | 1.2                  | 6.8  | 3.0 | SW                                | 23.0             | 39.0 | 29.5 | 35                            | 77  | 61.6 | 751                | 0             | Clear          |
| 24/25.05.12 | 1.8                  | 4.6  | 3.4 | SE                                | 23.0             | 39.5 | 29.6 | 36                            | 76  | 61.2 | 751                | 0             | Clear          |
| 25/26.05.12 | <1.0                 | 4.8  | 2.6 | SSE                               | 23.5             | 40.0 | 29.5 | 34                            | 81  | 60.6 | 751                | 0             | Clear          |
| 26/27.05.12 | <1.0                 | 6.7  | 2.8 | SE                                | 23.0             | 38.5 | 28.5 | 32                            | 80  | 59.2 | 751                | 0             | Clear          |
| Season      | <1.0                 | 18.8 | 3.0 | SW                                | 20.5             | 44.0 | 29.7 | 28                            | 88  | 59.7 | 751                | 0             | Clear          |

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Corezone (Store)(A1)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 90                                    | 27                                     | 16.8                                 | 21.0                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 93                                    | 28                                     | 15.8                                 | 23.3                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 86                                    | 26                                     | 16.4                                 | 24.0                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 84                                    | 25                                     | 17.0                                 | 24.6                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 94                                    | 28                                     | 16.2                                 | 23.0                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 84                                    | 25                                     | 13.7                                 | 21.6                     | 26                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 83                                    | 25                                     | 13.5                                 | 21.0                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 82                                    | 25                                     | 13.7                                 | 23.1                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 84                                    | 25                                     | 11.9                                 | 13.4                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 85                                    | 26                                     | 11.0                                 | 13.2                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 88                                    | 26                                     | 11.8                                 | 13.3                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 87                                    | 26                                     | 12.5                                 | 15.8                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 83                                    | 25                                     | 13.2                                 | 17.3                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 78                                    | 23                                     | 12.7                                 | 16.2                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 83                                    | 25                                     | 13.8                                 | 15.8                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 78                                    | 23                                     | 14.4                                 | 16.9                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 84                                    | 25                                     | 13.6                                 | 15.1                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 83                                    | 25                                     | 14.0                                 | 15.4                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 81                                    | 24                                     | 13.3                                 | 13.6                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 64                                    | 19                                     | 13.8                                 | 14.8                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 77                                    | 23                                     | 13.5                                 | 14.6                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 87                                    | 26                                     | 14.0                                 | 14.1                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 92                                    | 28                                     | 13.3                                 | 13.7                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 87                                    | 26                                     | 12.5                                 | 12.9                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>  
 BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>  
 BDL Values for CO = <114.5 µg/m<sup>3</sup>  
 BDL Values for BaP = <1 ng/m<sup>3</sup>

Richardson & Cruddas (1972) Limited

## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Corezone (Near Temple)(A2)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 106                                   | 34                                     | 15.7                                 | 18.8                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 102                                   | 33                                     | 16.0                                 | 18.5                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 93                                    | 30                                     | 15.8                                 | 18.2                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 94                                    | 30                                     | 15.3                                 | 17.2                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 89                                    | 28                                     | 16.6                                 | 19.5                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 98                                    | 31                                     | 16.3                                 | 19.2                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 106                                   | 34                                     | 15.9                                 | 19.1                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 102                                   | 33                                     | 15.6                                 | 19.0                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 94                                    | 30                                     | 15.5                                 | 18.4                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 104                                   | 33                                     | 15.7                                 | 18.8                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 96                                    | 31                                     | 16.3                                 | 19.0                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 108                                   | 35                                     | 15.1                                 | 18.5                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 115                                   | 37                                     | 15.5                                 | 18.1                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 103                                   | 33                                     | 15.2                                 | 17.3                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 90                                    | 29                                     | 15.8                                 | 18.9                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 107                                   | 34                                     | 15.6                                 | 18.1                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 113                                   | 36                                     | 14.7                                 | 16.9                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 101                                   | 32                                     | 14.9                                 | 17.8                     | 12                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 99                                    | 32                                     | 14.5                                 | 17.1                     | 12                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 107                                   | 34                                     | 14.9                                 | 17.3                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 102                                   | 33                                     | 13.7                                 | 14.8                     | 11                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 93                                    | 30                                     | 14.4                                 | 15.5                     | 10                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 102                                   | 33                                     | 14.7                                 | 15.6                     | 11                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 98                                    | 31                                     | 15.1                                 | 15.8                     | 12                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>  
 BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>  
 BDL Values for CO = <114.5 µg/m<sup>3</sup>  
 BDL Values for BaP = <1 ng/m<sup>3</sup>

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## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Mandlia (A3)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 77                                    | 27                                     | 15.1                                 | 19.2                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 75                                    | 26                                     | 15.4                                 | 19.3                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 78                                    | 27                                     | 15.3                                 | 18.6                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 76                                    | 27                                     | 14.8                                 | 19.4                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 74                                    | 26                                     | 16.0                                 | 18.4                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 78                                    | 27                                     | 15.6                                 | 19.4                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 76                                    | 27                                     | 15.4                                 | 18.6                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 74                                    | 26                                     | 15.2                                 | 19.8                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 78                                    | 27                                     | 14.6                                 | 18.0                     | 17                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 79                                    | 28                                     | 15.2                                 | 18.3                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 73                                    | 26                                     | 15.0                                 | 17.9                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 66                                    | 23                                     | 14.7                                 | 18.3                     | 21                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 68                                    | 24                                     | 14.9                                 | 19.4                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 69                                    | 24                                     | 14.6                                 | 20.3                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 69                                    | 24                                     | 15.5                                 | 19.3                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 77                                    | 27                                     | 15.3                                 | 20.1                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 78                                    | 27                                     | 14.2                                 | 19.6                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 76                                    | 26                                     | 14.8                                 | 19.3                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 79                                    | 28                                     | 14.3                                 | 18.1                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 82                                    | 29                                     | 14.6                                 | 17.6                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 81                                    | 28                                     | 14.2                                 | 17.7                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 78                                    | 27                                     | 14.8                                 | 19.3                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 82                                    | 29                                     | 14.7                                 | 19.7                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 78                                    | 27                                     | 15.0                                 | 19.6                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>BDL Values for CO = <114.5 µg/m<sup>3</sup>BDL Values for BaP = <1 ng/m<sup>3</sup>

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## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Gandghora (A4)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 66                                    | 23                                     | 17.9                                 | 18.7                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 72                                    | 25                                     | 18.2                                 | 19                       | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 73                                    | 26                                     | 17.6                                 | 18.4                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 74                                    | 26                                     | 17.9                                 | 18.5                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 75                                    | 26                                     | 18.3                                 | 18.1                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 68                                    | 24                                     | 18.5                                 | 18.4                     | 17                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 76                                    | 27                                     | 18.6                                 | 18.7                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 65                                    | 23                                     | 19.0                                 | 19.1                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 67                                    | 23                                     | 19.2                                 | 19.4                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 76                                    | 27                                     | 19.7                                 | 19.5                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 68                                    | 24                                     | 20.0                                 | 19.0                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 74                                    | 26                                     | 20.4                                 | 19.2                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 71                                    | 25                                     | 19.9                                 | 18.6                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 77                                    | 27                                     | 20.1                                 | 18.8                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 68                                    | 24                                     | 19.3                                 | 18.1                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 67                                    | 23                                     | 19.6                                 | 18.4                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 74                                    | 26                                     | 18.1                                 | 17.7                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 69                                    | 24                                     | 18.4                                 | 18.1                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 70                                    | 25                                     | 17.7                                 | 17.3                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 73                                    | 26                                     | 18.0                                 | 17.7                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 69                                    | 24                                     | 18.3                                 | 17.0                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 67                                    | 23                                     | 18.4                                 | 17.4                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 68                                    | 24                                     | 17.7                                 | 17.1                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 77                                    | 27                                     | 17.9                                 | 17.3                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>

BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>

BDL Values for CO = <114.5 µg/m<sup>3</sup>

BDL Values for BaP = <1 ng/m<sup>3</sup>

## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Gandhi Chowk (A5)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 77                                    | 29                                     | 14.3                                 | 18.6                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 74                                    | 28                                     | 14.6                                 | 18.9                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 72                                    | 27                                     | 14.0                                 | 18.3                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 73                                    | 28                                     | 14.3                                 | 18.4                     | 17                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 80                                    | 30                                     | 14.7                                 | 18.0                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 75                                    | 29                                     | 14.9                                 | 18.3                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 81                                    | 31                                     | 15.0                                 | 18.6                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 77                                    | 29                                     | 15.4                                 | 19.0                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 75                                    | 29                                     | 15.6                                 | 19.3                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 80                                    | 30                                     | 16.1                                 | 19.4                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 71                                    | 27                                     | 16.4                                 | 18.9                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 74                                    | 28                                     | 16.8                                 | 19.1                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 77                                    | 29                                     | 16.3                                 | 18.5                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 74                                    | 28                                     | 16.5                                 | 18.7                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 71                                    | 27                                     | 15.7                                 | 18.0                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 69                                    | 26                                     | 16.0                                 | 18.3                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 73                                    | 28                                     | 14.5                                 | 17.6                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 71                                    | 27                                     | 14.8                                 | 18.0                     | 21                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 75                                    | 29                                     | 14.1                                 | 17.2                     | 21                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 72                                    | 27                                     | 14.4                                 | 17.6                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 69                                    | 26                                     | 14.7                                 | 16.9                     | 21                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 68                                    | 26                                     | 14.8                                 | 17.3                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 70                                    | 27                                     | 14.1                                 | 17.0                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 73                                    | 28                                     | 14.3                                 | 17.2                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>  
 BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>  
 BDL Values for CO = <114.5 µg/m<sup>3</sup>  
 BDL Values for BaP = <1 ng/m<sup>3</sup>

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## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Chheikuthi (A6)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 66                                    | 22                                     | 12.8                                 | 16.2                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 76                                    | 26                                     | 12.6                                 | 16.7                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 80                                    | 27                                     | 12.2                                 | 16.8                     | 21                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 81                                    | 28                                     | 11.7                                 | 17.2                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 80                                    | 27                                     | 12.8                                 | 16.9                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 78                                    | 27                                     | 13.2                                 | 17.4                     | 21                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 81                                    | 28                                     | 13.8                                 | 17.1                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 82                                    | 28                                     | 13.2                                 | 17.0                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 75                                    | 26                                     | 11.8                                 | 16.6                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 72                                    | 24                                     | 12.2                                 | 16.7                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 66                                    | 22                                     | 11.3                                 | 17.7                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 64                                    | 22                                     | 11.6                                 | 17.8                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 76                                    | 26                                     | 11.4                                 | 18.3                     | 23                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 82                                    | 28                                     | 12.1                                 | 19.0                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 84                                    | 29                                     | 10.8                                 | 19.1                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 59                                    | 20                                     | 10.6                                 | 19.3                     | 27                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 58                                    | 20                                     | 11.3                                 | 18.8                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 59                                    | 20                                     | 11.8                                 | 18.6                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 68                                    | 23                                     | 10.8                                 | 19.0                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 66                                    | 22                                     | 10.6                                 | 18.1                     | 26                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 67                                    | 23                                     | 10.6                                 | 17.8                     | 24                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 66                                    | 22                                     | 10.7                                 | 17.5                     | 25                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 69                                    | 23                                     | 10.8                                 | 17.6                     | 26                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 64                                    | 22                                     | 11.1                                 | 17.2                     | 28                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>  
 BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>  
 BDL Values for CO = <114.5 µg/m<sup>3</sup>  
 BDL Values for BaP = <1 ng/m<sup>3</sup>

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## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Jamkani (A7)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 54                                    | 18                                     | 10.3                                 | 13.4                     | 12                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 52                                    | 18                                     | 11.0                                 | 14.3                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 62                                    | 21                                     | 10.4                                 | 13.6                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 56                                    | 19                                     | 11.3                                 | 14.4                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 60                                    | 20                                     | 12.1                                 | 15.2                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 58                                    | 20                                     | 12.2                                 | 15.3                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 51                                    | 17                                     | 11.3                                 | 14.4                     | 12                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 56                                    | 19                                     | 10.4                                 | 13.6                     | 11                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 44                                    | 15                                     | 11.2                                 | 14.5                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 47                                    | 16                                     | 12.3                                 | 16.2                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 45                                    | 15                                     | 12.0                                 | 16.1                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 42                                    | 14                                     | 11.1                                 | 16.1                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 48                                    | 16                                     | 10.4                                 | 14.2                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 53                                    | 18                                     | 11.3                                 | 14.4                     | 17                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 49                                    | 17                                     | 10.0                                 | 13.3                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 46                                    | 16                                     | 12.6                                 | 15.2                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 43                                    | 15                                     | 11.2                                 | 14.6                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 45                                    | 15                                     | 12.1                                 | 16.7                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 47                                    | 16                                     | 13.1                                 | 16.4                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 44                                    | 15                                     | 12.4                                 | 16.2                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 48                                    | 16                                     | 11.5                                 | 14.3                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 55                                    | 19                                     | 11.6                                 | 14.6                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 48                                    | 16                                     | 10.3                                 | 13.4                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 43                                    | 15                                     | 11.1                                 | 14.4                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>  
 BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>  
 BDL Values for CO = <114.5 µg/m<sup>3</sup>  
 BDL Values for BaP = <1 ng/m<sup>3</sup>

Richardson &amp; Cruddas (1972) Limited

## Annexure-II (Contd.)

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Location : Lajkura (A8)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / Fine Particulate Matter

| Week | Date       | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NOx<br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | O <sub>3</sub><br>µg/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO<br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> |
|------|------------|---------------------------------------|--|--------------------------------------|--------------------------|--------------------------------------|-------------------------------------|--|-------------------------|--------------------------|
| I    | 06.03.2012 | 62                                    | 21                                     | 12.3                                 | 16.6                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 07.03.2012 | 60                                    | 20                                     | 13.7                                 | 17.5                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| II   | 15.03.2012 | 70                                    | 24                                     | 12.5                                 | 16.8                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 16.03.2012 | 64                                    | 22                                     | 12.3                                 | 17.6                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| III  | 25.03.2012 | 68                                    | 23                                     | 12.1                                 | 18.4                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 26.03.2012 | 66                                    | 22                                     | 11.7                                 | 18.5                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IV   | 30.03.2012 | 59                                    | 20                                     | 11.3                                 | 17.6                     | 14                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 31.03.2012 | 64                                    | 22                                     | 11.5                                 | 16.8                     | 13                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| V    | 05.04.2012 | 52                                    | 18                                     | 11.4                                 | 17.7                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 06.04.2012 | 55                                    | 19                                     | 11.3                                 | 19.4                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VI   | 14.04.2012 | 53                                    | 18                                     | 11.7                                 | 19.3                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 15.04.2012 | 50                                    | 17                                     | 11.5                                 | 19.3                     | 22                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VII  | 18.04.2012 | 57                                    | 19                                     | 11.1                                 | 17.4                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 19.04.2012 | 62                                    | 21                                     | 10.9                                 | 17.6                     | 19                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| VIII | 23.04.2012 | 58                                    | 20                                     | 10.5                                 | 16.5                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 24.04.2012 | 55                                    | 19                                     | 10.3                                 | 18.4                     | 17                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| IX   | 02.05.2012 | 52                                    | 18                                     | 10.5                                 | 17.8                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 03.05.2012 | 54                                    | 18                                     | 10.6                                 | 19.9                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| X    | 08.05.2012 | 56                                    | 19                                     | 10.9                                 | 19.6                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 09.05.2012 | 53                                    | 18                                     | 10.9                                 | 19.4                     | 20                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XI   | 16.05.2012 | 57                                    | 19                                     | 10.8                                 | 17.5                     | 18                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 17.05.2012 | 64                                    | 22                                     | 10.9                                 | 17.8                     | 17                                   | BDL                                 | BDL  | BDL                     | BDL                      |
| XII  | 24.05.2012 | 57                                    | 19                                     | 10.9                                 | 16.6                     | 16                                   | BDL                                 | BDL  | BDL                     | BDL                      |
|      | 25.05.2012 | 51                                    | 17                                     | 10.8                                 | 17.6                     | 15                                   | BDL                                 | BDL  | BDL                     | BDL                      |

BDL Values for O<sub>3</sub> = <10 µg/m<sup>3</sup>  
 BDL Values for C<sub>6</sub>H<sub>6</sub> = <0.01 µg/m<sup>3</sup>  
 BDL Values for CO = <114.5 µg/m<sup>3</sup>  
 BDL Values for BaP = <1 ng/m<sup>3</sup>

Richardson &amp; Cruddas (1972) Limited

**REPORT ON AMBIENT AIR QUALITY DATA**

Name of Project : Orient UGP (IB Valley area)  
 Season : Summer 2012  
 Instrument used : Respirable dust sampler / ICP - MS

**Analysis of Heavy Metals in PM<sub>10</sub> Samples***Unit : ng/m<sup>3</sup>*

| Location Code | Date of sampling | As  | Co  | Hg  | Se  | Cr  | Cu   | Mn   | Ni   | Pb   | Zn   |
|---------------|------------------|-----|-----|-----|-----|-----|------|------|------|------|------|
| A1            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.07 | 0.11 | 0.07 | 0.04 | 1.24 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.04 | 0.09 | 0.07 | 0.08 | 1.20 |
| A2            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.04 | 0.13 | 0.12 | 0.04 | 1.36 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.06 | 0.07 | 0.10 | 0.04 | 1.66 |
| A3            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.04 | 0.22 | 0.09 | 0.06 | 1.08 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.06 | 0.16 | 0.08 | 0.05 | 1.16 |
| A4            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.05 | 0.15 | 0.10 | 0.07 | 1.00 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.06 | 0.15 | 0.10 | 0.06 | 1.06 |
| A5            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.08 | 0.21 | 0.12 | 0.07 | 1.33 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.05 | 0.20 | 0.11 | 0.10 | 1.44 |
| A6            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.07 | 0.18 | 0.14 | 0.12 | 1.30 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.09 | 0.18 | 0.16 | 0.12 | 1.40 |
| A7            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.05 | 0.08 | 0.09 | 0.07 | 1.08 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.05 | 0.11 | 0.02 | 0.06 | 1.00 |
| A8            | 05.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.04 | 0.06 | 0.03 | 0.04 | 1.14 |
|               | 06.04.2012       | BDL | BDL | BDL | BDL | BDL | 0.06 | 0.03 | 0.08 | 0.16 | 1.10 |

BDL Values for As: < 0.30 ng/m<sup>3</sup>  
 BDL Values for Hg: <0.01 ng/m<sup>3</sup>  
 BDL Values for Cr: <0.004 ng/m<sup>3</sup>

BDL Values for Co: <0.01 ng/m<sup>3</sup>  
 BDL Values for Se: <1.10 ng/m<sup>3</sup>

**Richardson & Cruddas (1972) Limited**

## Annexure-III

## WATER QUALITY DATA

Location : Mine discharge - Orient UGP (W1)

| S. No | Parameter                                     | Unit   | Result  | General Standards for discharge of Effluents into Inland Surface water GSR 422(E) |
|-------|---|--|---|---|
| 1.    | Colour & Odour                                | Pt-Co  | 15 & Odourless  | -   |
| 2.    | Total Suspended Solids                        | mg/l   | 38  | 100   |
| 3.    | Particle size of suspended solids             | Shall pass 850 micron ISI sieve                      | 100% are passing through 850 micron ISI sieve         | Shall pass 850 micron ISI sieve   |
| 4.    | Total Dissolved solids                        | mg/l   | 480   | -   |
| 5.    | pH  | -  | 8.08  | 5.5-9.0   |
| 6.    | Temperature                                   | °C   | 29  | 5°C above water temperature   |
| 7.    | Oil & Grease                                  | mg/l   | Nil   | 10  |
| 8.    | Total residual chlorine                       | mg/l   | Nil   | 1.0   |
| 9.    | Ammonical Nitrogen (as N)                     | mg/l   | 0.48  | 50  |
| 10.   | Kjeldahl nitrogen                             | mg/l   | 1.12  | 100   |
| 11.   | Free ammonia (as NH <sub>3</sub> )            | mg/l   | Nil   | 5.0   |
| 12.   | BOD - 3 Days at 27°C                          | mg/l   | 8   | 30  |
| 13.   | COD   | mg/l   | 52  | 250   |
| 14.   | Arsenic (as As)                               | mg/l   | <0.01   | 0.2   |
| 15.   | Mercury (as Hg)                               | mg/l   | <0.001  | 0.01  |
| 16.   | Lead (as Pb)                                  | mg/l   | <0.01   | 0.01  |
| 17.   | Cadmium (as Cd)                               | mg/l   | <0.01   | 2   |
| 18.   | Hexavalent Chromium (as Cr <sup>6+</sup> )    | mg/l   | <0.001  | 0.10  |
| 19.   | Total Chromium                                | mg/l   | <0.001  | 2.0   |
| 20.   | Copper (as Cu)                                | mg/l   | <0.001  | 3   |
| 21.   | Zinc (as Zn)                                  | mg/l   | <0.01   | 5   |
| 22.   | Selenium (as Se)                              | mg/l   | <0.01   | 0.05  |
| 23.   | Nickel (as Ni)                                | mg/l   | <0.01   | 3   |
| 24.   | Boron (as B)                                  | mg/l   | <0.01   | -   |
| 25.   | Percent Sodium                                | mg/l   | 39.48   | -   |
| 26.   | Residual Sodium Carbonate                     | mg/l   | Nil   | -   |
| 27.   | Cyanides (as CN)                              | mg/l   | Nil   | 0.2   |
| 28.   | Chloride (as Cl)                              | mg/l   | 120   | -   |
| 29.   | Fluorides (as F)                              | mg/l   | 0.14  | 2   |
| 30.   | Dissolved Phosphates (as PO <sub>4</sub> )    | mg/l   | 0.68  | 5.0   |
| 31.   | Sulphates (as SO <sub>4</sub> )               | mg/l   | 38  | -   |
| 32.   | Sulphides (as S)                              | mg/l   | Nil   | 2   |
| 33.   | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l   | Nil   | 1.0   |
| 34.   | Bio-assay test                                | 90% survival of fish after 96 hours in 100% effluent | 100% survival of fish after 96 hours in 100% effluent | 90% survival of fish after 96 hours in 100% effluent                              |
| 35.   | Manganese (as mn)                             | mg/l   | Nil   | 2.0   |
| 36.   | Iron (as Fe <sup>+2</sup> )                   | mg/l   | 0.22  | 3.0   |
| 37.   | Vanadium (as V)                               | mg/l   | Nil   | 0.2   |
| 38.   | Nitrate Nitrogen                              | mg/l   | 2.34  | 10  |

## WATER QUALITY DATA

Location : Nallah Near Core Zone (W2)

| Sl. No. | Parameter                                     | Unit        | Result | IS:2296-1982 Tolerance limits for Inland Surface water (Class C) |
|---------|---|-------------|--------|--|
| 1       | pH  | -           | 7.96   | 6.5 - 8.5  |
| 2       | Colour  | Hazen Units | 18     | 300  |
| 3       | Temperature                                   | °C          | 28.5   | -  |
| 4       | Turbidity                                     | NTU         | 30     | -  |
| 5       | Total suspended solids                        | mg/l        | 28     | -  |
| 6       | Total dissolved solids                        | mg/l        | 612    | 1500   |
| 7       | Total volatile solids                         | mg/l        | --     | -  |
| 8       | Dissolved Oxygen                              | mg/l        | 5.6    | 4.0  |
| 9       | BOD - 3 days, 27°C                            | mg/l        | 2      | 3.0  |
| 10      | COD   | mg/l        | 34     | -  |
| 11      | Oil & grease                                  | mg/l        | Nil    | -  |
| 12      | Residual chlorine                             | mg/l        | Nil    | -  |
| 13      | Chloride (as Cl)                              | mg/l        | 174    | 600  |
| 14      | Fluoride (as F)                               | mg/l        | 0.30   | 1.5  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 68     | 400  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -  |
| 17      | Cyanide (as CN)                               | mg/l        | <0.01  | 0.05   |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent   |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.005  |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05   |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 1.5  |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.05   |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.2  |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -  |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01   |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -  |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -  |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | -  |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -  |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.1  |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.14   | 15   |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -  |
| 32      | Alkalinity to methyl orange                   | mg/l        | 170    | -  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.24   | 50   |
| 35      | Calcium (as Ca)                               | mg/l        | 62     | -  |
| 36      | Magnesium (as Mg)                             | mg/l        | 20     | -  |
| 37      | Total Nitrogen (as N)                         | mg/l        | 3.8    | -  |
| 38      | Percent sodium                                | %           | 39.32  | -  |
| 39      | Coliform organisms                            | MPN/100ml   | <1100  | 5000   |
| 40      | Sodium (as Na)                                | mg/l        | 79     | -  |
| 41      | Potassium (as K)                              | mg/l        | 22     | -  |

## WATER QUALITY DATA

Location : Pond Water Bundia Village (W3)

| Sl. No. | Parameter                                     | Unit        | Result | IS:2296-1982 Tolerance limits for Inland Surface water (Class C) |
|---------|---|-------------|--------|--|
| 1       | pH  | -           | 7.84   | 6.5 - 8.5  |
| 2       | Colour  | Hazen Units | 18     | 300  |
| 3       | Temperature                                   | °C          | 28     | -  |
| 4       | Turbidity                                     | NTU         | 20     | -  |
| 5       | Total suspended solids                        | mg/l        | 18     | -  |
| 6       | Total dissolved solids                        | mg/l        | 452    | 1500   |
| 7       | Total volatile solids                         | mg/l        | --     | -  |
| 8       | Dissolved Oxygen                              | mg/l        | 5.7    | 4.0  |
| 9       | BOD - 3 days, 27°C                            | mg/l        | --     | 3.0  |
| 10      | COD   | mg/l        | 14     | -  |
| 11      | Oil & grease                                  | mg/l        | Nil    | -  |
| 12      | Residual chlorine                             | mg/l        | Nil    | -  |
| 13      | Chloride (as Cl)                              | mg/l        | 94     | 600  |
| 14      | Fluoride (as F)                               | mg/l        | 0.10   | 1.5  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 24     | 400  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -  |
| 17      | Cyanide (as CN)                               | mg/l        | <0.01  | 0.05   |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent   |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.005  |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05   |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 1.5  |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.05   |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.2  |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -  |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01   |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -  |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -  |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | -  |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -  |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.1  |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.10   | 15   |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -  |
| 32      | Alkalinity to methyl orange                   | mg/l        | 170    | -  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.09   | 50   |
| 35      | Calcium (as Ca)                               | mg/l        | 80     | -  |
| 36      | Magnesium (as Mg)                             | mg/l        | 22     | -  |
| 37      | Total Nitrogen (as N)                         | mg/l        | 0.78   | -  |
| 38      | Percent sodium                                | %           | 30.95  | -  |
| 39      | Coliform organisms                            | MPN/100ml   | <1100  | 5000   |
| 40      | Sodium (as Na)                                | mg/l        | 48     | -  |
| 41      | Potassium (as K)                              | mg/l        | 20     | -  |

## WATER QUALITY DATA

Location : Ib River Up Stream (W4)

| Sl. No. | Parameter                                     | Unit        | Result | IS:2296-1982 Tolerance limits for Inland Surface water (Class C) |
|---------|---|-------------|--------|--|
| 1       | pH  | -           | 7.08   | 6.5 - 8.5  |
| 2       | Colour  | Hazen Units | 5      | 300  |
| 3       | Temperature                                   | °C          | 28     | -  |
| 4       | Turbidity                                     | NTU         | 5      | -  |
| 5       | Total suspended solids                        | mg/l        | 18     | -  |
| 6       | Total dissolved solids                        | mg/l        | 254    | 1500   |
| 7       | Total volatile solids                         | mg/l        | --     | -  |
| 8       | Dissolved Oxygen                              | mg/l        | 6.1    | 4.0  |
| 9       | BOD - 3 days, 27°C                            | mg/l        | --     | 3.0  |
| 10      | COD   | mg/l        | 12     | -  |
| 11      | Oil & grease                                  | mg/l        | Nil    | -  |
| 12      | Residual chlorine                             | mg/l        | Nil    | -  |
| 13      | Chloride (as Cl)                              | mg/l        | 54     | 600  |
| 14      | Fluoride (as F)                               | mg/l        | 0.10   | 1.5  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 14     | 400  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -  |
| 17      | Cyanide (as CN)                               | mg/l        | <0.01  | 0.05   |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent   |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.005  |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05   |
| 21      | Copper (as Cu)                                | mg/l        | <0.001 | 1.5  |
| 22      | Selenium (as Se)                              | mg/l        | <0.001 | 0.05   |
| 22      | Arsenic (as As)                               | mg/l        | <0.001 | 0.2  |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -  |
| 24      | Cadmium                                       | mg/l        | <0.001 | 0.01   |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -  |
| 26      | Boron (as B)                                  | mg/l        | <0.1   | -  |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | -  |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -  |
| 29      | Lead (as Pb)                                  | mg/l        | <0.001 | 0.1  |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.08   | 15   |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -  |
| 32      | Alkalinity to methyl orange                   | mg/l        | 102    | -  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.12   | 50   |
| 35      | Calcium (as Ca)                               | mg/l        | 40     | -  |
| 36      | Magnesium (as Mg)                             | mg/l        | 12     | -  |
| 37      | Total Nitrogen (as N)                         | mg/l        | 0.48   | -  |
| 38      | Percent sodium                                | %           | 29.8   | -  |
| 39      | Coliform organisms                            | MPN/100ml   | <1100  | 5000   |
| 40      | Sodium (as Na)                                | mg/l        | 29     | -  |
| 41      | Potassium (as K)                              | mg/l        | 10     | -  |

## WATER QUALITY DATA

Location : Ib River D/S (W5)

| Sl. No. | Parameter                                     | Unit        | Result | IS:2296-1982 Tolerance limits for Inland Surface water (Class C) |
|---------|---|-------------|--------|--|
| 1       | pH  | -           | 7.14   | 6.5 - 8.5  |
| 2       | Colour  | Hazen Units | 6      | 300  |
| 3       | Temperature                                   | °C          | 28.0   | -  |
| 4       | Turbidity                                     | NTU         | 6      | -  |
| 5       | Total suspended solids                        | mg/l        | 22     | -  |
| 6       | Total dissolved solids                        | mg/l        | 312    | 1500   |
| 7       | Total volatile solids                         | mg/l        | --     | -  |
| 8       | Dissolved Oxygen                              | mg/l        | 6      | 4.0  |
| 9       | BOD - 3 days, 27°C                            | mg/l        | --     | 3.0  |
| 10      | COD   | mg/l        | 13     | -  |
| 11      | Oil & grease                                  | mg/l        | Nil    | -  |
| 12      | Residual chlorine                             | mg/l        | Nil    | -  |
| 13      | Chloride (as Cl)                              | mg/l        | 58     | 600  |
| 14      | Flouride (as F)                               | mg/l        | 0.12   | 1.5  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 16     | 400  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -  |
| 17      | Cyanide (as CN)                               | mg/l        | <0.01  | 0.05   |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent   |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.005  |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05   |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 1.5  |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.05   |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.2  |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -  |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01   |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -  |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -  |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | -  |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -  |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.1  |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.10   | 15   |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -  |
| 32      | Alkalinity to methyl orange                   | mg/l        | 132    | -  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.12   | 50   |
| 35      | Calcium (as Ca)                               | mg/l        | 44     | -  |
| 36      | Magnesium (as Mg)                             | mg/l        | 15     | -  |
| 37      | Total Nitrogen (as N)                         | mg/l        | 0.78   | -  |
| 38      | Percent sodium                                | %           | 27.14  | -  |
| 39      | Coliform organisms                            | MPN/100ml   | <1100  | 5000   |
| 40      | Sodium (as Na)                                | mg/l        | 32     | -  |
| 41      | Potassium (as K)                              | mg/l        | 12     | -  |

## WATER QUALITY DATA

Location : Tubewell, Brajrajnagar (W6)

| Sl. No. | Parameter                                     | Unit        | Result | IS: 10500-1991 Norms |
|---------|---|-------------|--------|----------------------|
| 1       | pH  | -           | 7.88   | 6.5 - 8.5            |
| 2       | Colour  | Hazen Units | <5     | 10                   |
| 3       | Temperature                                   | °C          | 29     | -                    |
| 4       | Turbidity                                     | NTU         | 6      | 10                   |
| 5       | Total suspended solids                        | mg/l        | <2     | -                    |
| 6       | Total dissolved solids                        | mg/l        | 388    | 500                  |
| 7       | Total volatile solids                         | mg/l        | -      | -                    |
| 8       | Dissolved Oxygen                              | mg/l        | 4.2    | -                    |
| 9       | BOD - 3 days at 27°C                          | mg/l        | -      | -                    |
| 10      | COD   | mg/l        | 18     | -                    |
| 11      | Oil & grease                                  | mg/l        | Nil    | -                    |
| 12      | Residual chlorine                             | mg/l        | Nil    | 0.2                  |
| 13      | Chloride (as Cl)                              | mg/l        | 66     | 250                  |
| 14      | Fluoride (as F)                               | mg/l        | 0.09   | 1.0                  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 24     | 200                  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -                    |
| 17      | Cyanide (as CN)                               | mg/l        | Nil    | 0.05                 |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent               |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.001                |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05                 |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 0.05                 |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.01                 |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.05                 |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -                    |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01                 |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -                    |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -                    |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | 0.001                |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -                    |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.05                 |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.08   | 5                    |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -                    |
| 32      | Alkalinity to methyl orange                   | mg/l        | 156    | 200                  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.08   | 0.3                  |
| 34      | Total Hardness                                | mg/l        | 182    | 300                  |
| 35      | Calcium (as Ca)                               | mg/l        | 48     | 75                   |
| 36      | Magnesium (as Mg)                             | mg/l        | 15     | 30                   |
| 37      | Total Nitrogen (as N)                         | mg/l        | Nil    | -                    |
| 38      | Percent sodium                                | %           | 31.07  | -                    |
| 39      | Coliform organisms                            | MPN/100ml   | -0-    | Absent               |
| 40      | Sodium, (as Na)                               | mg/l        | 40     | 6.5 - 8.5            |
| 41      | Potassium (as K)                              | mg/l        | 9      | 10                   |

## WATER QUALITY DATA

Location : Tube well Juribaga village (W7)

| Sl. No. | Parameter                                     | Unit        | Result | IS: 10500-1991 Norms |
|---------|---|-------------|--------|----------------------|
| 1       | pH  | -           | 7.28   | 6.5 - 8.5            |
| 2       | Colour  | Hazen Units | <5     | 10                   |
| 3       | Temperature                                   | °C          | 29     | -                    |
| 4       | Turbidity                                     | NTU         | 7      | 10                   |
| 5       | Total suspended solids                        | mg/l        | <2     | -                    |
| 6       | Total dissolved solids                        | mg/l        | 362    | 500                  |
| 7       | Total volatile solids                         | mg/l        | -      | -                    |
| 8       | Dissolved Oxygen                              | mg/l        | 4.4    | -                    |
| 9       | BOD - 3 days at 27°C                          | mg/l        | -      | -                    |
| 10      | COD   | mg/l        | 16     | -                    |
| 11      | Oil & grease                                  | mg/l        | Nil    | -                    |
| 12      | Residual chlorine                             | mg/l        | Nil    | 0.2                  |
| 13      | Chloride (as Cl)                              | mg/l        | 54     | 250                  |
| 14      | Fluoride (as F)                               | mg/l        | 0.10   | 1.0                  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 16     | 200                  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -                    |
| 17      | Cyanide (as CN)                               | mg/l        | Nil    | 0.05                 |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent               |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.001                |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05                 |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 0.05                 |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.01                 |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.05                 |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -                    |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01                 |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -                    |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -                    |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | 0.001                |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -                    |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.05                 |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.08   | 5                    |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -                    |
| 32      | Alkalinity to methyl orange                   | mg/l        | 166    | 200                  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.12   | 0.3                  |
| 34      | Total Hardness                                | mg/l        | 177    | 300                  |
| 35      | Calcium (as Ca)                               | mg/l        | 40     | 75                   |
| 36      | Magnesium (as Mg)                             | mg/l        | 18     | 30                   |
| 37      | Total Nitrogen (as N)                         | mg/l        | Nil    | -                    |
| 38      | Percent sodium                                | %           | 32.7   | -                    |
| 39      | Coliform organisms                            | MPN/100ml   | -0-    | Absent               |
| 40      | Sodium, (as Na)                               | mg/l        | 50     | 6.5 - 8.5            |
| 41      | Potassium (as K)                              | mg/l        | 15     | 10                   |

## WATER QUALITY DATA

Location : Dugwell, Katapalli village (W8)

| Sl. No. | Parameter                                     | Unit        | Result | IS: 10500-1991 Norms |
|---------|---|-------------|--------|----------------------|
| 1       | pH  | -           | 7.78   | 6.5 - 8.5            |
| 2       | Colour  | Hazen Units | <5     | 10                   |
| 3       | Temperature                                   | °C          | 29.0   | -                    |
| 4       | Turbidity                                     | NTU         | 5      | 10                   |
| 5       | Total suspended solids                        | mg/l        | <2     | -                    |
| 6       | Total dissolved solids                        | mg/l        | 410    | 500                  |
| 7       | Total volatile solids                         | mg/l        | -      | -                    |
| 8       | Dissolved Oxygen                              | mg/l        | 4.8    | -                    |
| 9       | BOD - 3 days at 27°C                          | mg/l        | -      | -                    |
| 10      | COD   | mg/l        | 15     | -                    |
| 11      | Oil & grease                                  | mg/l        | Nil    | -                    |
| 12      | Residual chlorine                             | mg/l        | Nil    | 0.2                  |
| 13      | Chloride (as Cl)                              | mg/l        | 88     | 250                  |
| 14      | Fluoride (as F)                               | mg/l        | 0.09   | 1.0                  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 24     | 200                  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -                    |
| 17      | Cyanide (as CN)                               | mg/l        | Nil    | 0.05                 |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent               |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.001                |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05                 |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 0.05                 |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.01                 |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.05                 |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -                    |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01                 |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -                    |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -                    |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | 0.001                |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -                    |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.05                 |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.06   | 5                    |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -                    |
| 32      | Alkalinity to methyl orange                   | mg/l        | 170    | 200                  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.08   | 0.3                  |
| 34      | Total Hardness                                | mg/l        | 170    | 300                  |
| 35      | Calcium (as Ca)                               | mg/l        | 48     | 75                   |
| 36      | Magnesium (as Mg)                             | mg/l        | 12     | 30                   |
| 37      | Total Nitrogen (as N)                         | mg/l        | Nil    | -                    |
| 38      | Percent sodium                                | %           | 32.05  | -                    |
| 39      | Coliform organisms                            | MPN/100ml   | -0-    | Absent               |
| 40      | Sodium, (as Na)                               | mg/l        | 40     | 6.5 - 8.5            |
| 41      | Potassium (as K)                              | mg/l        | 12     | 10                   |

## WATER QUALITY DATA

Location : Dug well, Belpahar village (W9)

| Sl. No. | Parameter                                     | Unit        | Result | IS: 10500-1991 Norms |
|---------|---|-------------|--------|----------------------|
| 1       | pH  | -           | 7.25   | 6.5 - 8.5            |
| 2       | Colour  | Hazen Units | <5     | 10                   |
| 3       | Temperature                                   | °C          | 29.5   | -                    |
| 4       | Turbidity                                     | NTU         | 5      | 10                   |
| 5       | Total suspended solids                        | mg/l        | <2     | -                    |
| 6       | Total dissolved solids                        | mg/l        | 310    | 500                  |
| 7       | Total volatile solids                         | mg/l        | -      | -                    |
| 8       | Dissolved Oxygen                              | mg/l        | 4.8    | -                    |
| 9       | BOD - 3 days at 27°C                          | mg/l        | -      | -                    |
| 10      | COD   | mg/l        | 14     | -                    |
| 11      | Oil & grease                                  | mg/l        | Nil    | -                    |
| 12      | Residual chlorine                             | mg/l        | Nil    | 0.2                  |
| 13      | Chloride (as Cl)                              | mg/l        | 40     | 250                  |
| 14      | Flouride (as F)                               | mg/l        | 0.10   | 1.0                  |
| 15      | Sulphate (as SO <sub>4</sub> )                | mg/l        | 14     | 200                  |
| 16      | Sulphide (as S)                               | mg/l        | Nil    | -                    |
| 17      | Cyanide (as CN)                               | mg/l        | Nil    | 0.05                 |
| 18      | Insecticides/pesticides                       | mg/l        | Nil    | Absent               |
| 19      | Phenols (as C <sub>6</sub> H <sub>5</sub> OH) | mg/l        | <0.001 | 0.001                |
| 20      | Chromium (as Cr)                              | mg/l        | <0.01  | 0.05                 |
| 21      | Copper (as Cu)                                | mg/l        | <0.01  | 0.05                 |
| 22      | Selenium (as Se)                              | mg/l        | <0.01  | 0.01                 |
| 22      | Arsenic (as As)                               | mg/l        | <0.01  | 0.05                 |
| 23      | Barium (as Ba)                                | mg/l        | <0.01  | -                    |
| 24      | Cadmium                                       | mg/l        | <0.01  | 0.01                 |
| 25      | Nickel (as Ni)                                | mg/l        | <0.01  | -                    |
| 26      | Boron (as B)                                  | mg/l        | <0.01  | -                    |
| 27      | Mercury (as Hg)                               | mg/l        | <0.001 | 0.001                |
| 28      | Silver (as Ag)                                | mg/l        | <0.01  | -                    |
| 29      | Lead (as Pb)                                  | mg/l        | <0.01  | 0.05                 |
| 30      | Zinc (as Pb)                                  | mg/l        | 0.08   | 5                    |
| 31      | Alkalinity to phenolphthalein                 | mg/l        | Nil    | -                    |
| 32      | Alkalinity to methyl orange                   | mg/l        | 144    | 200                  |
| 33      | Iron (as Fe)                                  | mg/l        | 0.10   | 0.3                  |
| 34      | Total Hardness                                | mg/l        | 154    | 300                  |
| 35      | Calcium (as Ca)                               | mg/l        | 38     | 75                   |
| 36      | Magnesium (as Mg)                             | mg/l        | 14     | 30                   |
| 37      | Total Nitrogen (as N)                         | mg/l        | Nil    | -                    |
| 38      | Percent sodium                                | %           | 27.73  | -                    |
| 39      | Coliform organisms                            | MPN/100ml   | -0-    | Absent               |
| 40      | Sodium, (as Na)                               | mg/l        | 22     | 6.5 - 8.5            |
| 41      | Potassium (as K)                              | mg/l        | 8      | 10                   |

## Annexure- IV

**NOISE LEVEL DATA**

Location : Core zone (Store)(N1)

| Sl. No. | Time (Hrs.) |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|-------------|--------------------|------------------------------------|-------------|-------------|
|         |             |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | Day         | 06-10              | 53.9                               | 53.0        | 57.9        |
| 2.      |             | 10-14              | 56.9                               | 57.3        | 60.3        |
| 3.      |             | 14-18              | 61.5                               | 61.3        | 63.2        |
| 4.      |             | 18-22              | 57.9                               | 58.3        | 59.3        |
|         |             | <b>Leq. (Mean)</b> | <b>57.6</b>                        | <b>57.5</b> | <b>60.2</b> |
| 5.      | Night       | 22-02              | 54.9                               | 57.5        | 54.3        |
| 6.      |             | 02-06              | 53.2                               | 55.3        | 52.5        |
|         |             | <b>Leq. (Mean)</b> | <b>54.1</b>                        | <b>56.4</b> | <b>53.4</b> |

## NOISE LEVEL DATA

Location : Corezone (Near Temple)(N2)

| Sl. No. | Time (Hrs.) |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|-------------|--------------------|------------------------------------|-------------|-------------|
|         |             |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | Day         | 06-10              | 48.3                               | 49.4        | 52.3        |
| 2.      |             | 10-14              | 51.5                               | 52.2        | 60.0        |
| 3.      |             | 14-18              | 56.9                               | 57.7        | 63.4        |
| 4.      |             | 18-22              | 54.7                               | 54.5        | 55.3        |
|         |             | <b>Leq. (Mean)</b> | <b>52.9</b>                        | <b>53.5</b> | <b>57.8</b> |
| 5.      | Night       | 22-02              | 51.5                               | 54.7        | 51.3        |
| 6.      |             | 02-06              | 49.7                               | 52.3        | 49.7        |
|         |             | <b>Leq. (Mean)</b> | <b>50.6</b>                        | <b>53.5</b> | <b>50.5</b> |

## NOISE LEVEL DATA

Location : Mandlia Village (N3)

| Sl. No. | Time (Hrs.) |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|-------------|--------------------|------------------------------------|-------------|-------------|
|         |             |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | Day         | 06-10              | 43.6                               | 41.5        | 47.5        |
| 2.      |             | 10-14              | 46.9                               | 44.2        | 48.9        |
| 3.      |             | 14-18              | 48.9                               | 46.3        | 50.4        |
| 4.      |             | 18-22              | 43.7                               | 43.7        | 44.7        |
|         |             | <b>Leq. (Mean)</b> | <b>45.8</b>                        | <b>43.9</b> | <b>47.9</b> |
| 5.      | Night       | 22-02              | 41.7                               | 40.6        | 41.4        |
| 6.      |             | 02-06              | 39.0                               | 41.8        | 40.2        |
|         |             | <b>Leq. (Mean)</b> | <b>40.4</b>                        | <b>41.2</b> | <b>40.8</b> |

## NOISE LEVEL DATA

**Location : Gandghora (N4)**

| Sl. No. | Time (Hrs.)  |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|--------------|--------------------|------------------------------------|-------------|-------------|
|         |              |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | <b>Day</b>   | 06-10              | 42.3                               | 42.8        | 41.6        |
| 2.      |              | 10-14              | 45.3                               | 45.4        | 43.4        |
| 3.      |              | 14-18              | 46.9                               | 48.6        | 46.7        |
| 4.      |              | 18-22              | 42.4                               | 45.4        | 40.4        |
|         |              | <b>Leq. (Mean)</b> | <b>44.2</b>                        | <b>45.6</b> | <b>43.0</b> |
| 5.      | <b>Night</b> | 22-02              | 41.2                               | 43.5        | 38.2        |
| 6.      |              | 02-06              | 39.0                               | 41.9        | 37.4        |
|         |              | <b>Leq. (Mean)</b> | <b>40.1</b>                        | <b>42.7</b> | <b>37.8</b> |

## NOISE LEVEL DATA

Location : Gandhi Chowk (N5)

| Sl. No. | Time (Hrs.) |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|-------------|--------------------|------------------------------------|-------------|-------------|
|         |             |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | Day         | 06-10              | 46.7                               | 47.3        | 47.3        |
| 2.      |             | 10-14              | 49.3                               | 49.5        | 50.5        |
| 3.      |             | 14-18              | 50.9                               | 50.1        | 51.3        |
| 4.      |             | 18-22              | 43.9                               | 43.3        | 45.7        |
|         |             | <b>Leq. (Mean)</b> | <b>47.7</b>                        | <b>47.6</b> | <b>48.7</b> |
| 5.      | Night       | 22-02              | 41.3                               | 43.9        | 44.5        |
| 6.      |             | 02-06              | 40.5                               | 42.5        | 42.5        |
|         |             | <b>Leq. (Mean)</b> | <b>40.9</b>                        | <b>43.2</b> | <b>43.5</b> |

## NOISE LEVEL DATA

Location : Chheikuthi (N6)

| Sl. No. | Time (Hrs.) |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|-------------|--------------------|------------------------------------|-------------|-------------|
|         |             |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | Day         | 06-10              | 40.7                               | 40.6        | 41.2        |
| 2.      |             | 10-14              | 42.4                               | 41.7        | 42.4        |
| 3.      |             | 14-18              | 43.7                               | 43.0        | 44.3        |
| 4.      |             | 18-22              | 40.2                               | 40.1        | 40.7        |
|         |             | <b>Leq. (Mean)</b> | <b>41.8</b>                        | <b>41.4</b> | <b>42.2</b> |
| 5.      | Night       | 22-02              | 39.3                               | 41.4        | 37.9        |
| 6.      |             | 02-06              | 38.4                               | 40.7        | 39.0        |
|         |             | <b>Leq. (Mean)</b> | <b>38.9</b>                        | <b>41.1</b> | <b>38.5</b> |

## NOISE LEVEL DATA

Location : Jamkani (N7)

| Sl. No. | Time (Hrs.)  |                    | L <sub>eq</sub> Noise Level, dB(A) |            |          |
|---------|--------------|--------------------|------------------------------------|------------|----------|
|         |              |                    | March 2012                         | April 2012 | May 2012 |
| 1.      | <b>Day</b>   | 06-10              | 42.1                               | 43.1       | 40.8     |
| 2.      |              | 10-14              | 45.2                               | 44.2       | 43.2     |
| 3.      |              | 14-18              | 40.3                               | 46.2       | 39.3     |
| 4.      |              | 18-22              | 38.4                               | 42.4       | 38.7     |
|         |              | <b>Leq. (Mean)</b> | 41.5                               | 44.0       | 40.5     |
| 5.      | <b>Night</b> | 22-02              | 35.4                               | 38.5       | 37.9     |
| 6.      |              | 02-06              | 36.1                               | 35.4       | 35.9     |
|         |              | <b>Leq. (Mean)</b> | 35.8                               | 37.0       | 36.9     |

## NOISE LEVEL DATA

Location : Lajkura (N8)

| Sl. No. | Time (Hrs.) |                    | L <sub>eq</sub> Noise Level, dB(A) |             |             |
|---------|-------------|--------------------|------------------------------------|-------------|-------------|
|         |             |                    | March 2012                         | April 2012  | May 2012    |
| 1.      | Day         | 06-10              | 43.7                               | 41.7        | 42.4        |
| 2.      |             | 10-14              | 46.4                               | 43.2        | 44.3        |
| 3.      |             | 14-18              | 48.2                               | 46.1        | 46.7        |
| 4.      |             | 18-22              | 44.9                               | 40.5        | 41.8        |
|         |             | <b>Leq. (Mean)</b> | <b>45.8</b>                        | <b>42.9</b> | <b>43.8</b> |
| 5.      | Night       | 22-02              | 40.6                               | 39.3        | 37.4        |
| 6.      |             | 02-06              | 41.8                               | 40.5        | 38.7        |
|         |             | <b>Leq. (Mean)</b> | <b>41.2</b>                        | <b>39.9</b> | <b>38.1</b> |

## Annexure V

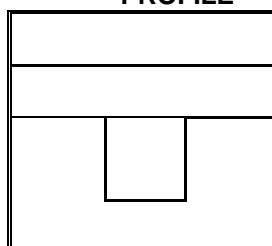
## SOIL QUALITY DATA

Location : Forest Land, Corezone (S1)

| Sl. No. | Parameter   | Depth, cm |         |         |
|---------|---|-----------|---------|---------|
|         |   | 0-30      | 30-60   | 60-100  |
| 1.      | pH  | 7.56      | 7.48    | 7.62    |
| 2.      | Temperature (°C)                                    | 28.0      | 25.8    | 24.3    |
| 3.      | Electrical conductivity (m-mhos/cm at 20°C)         | 252       | 139     | 129     |
| 4.      | Nitrogen, kg/ha                                     | 458       | 436     | 435     |
| 5.      | Phosphorus, kg/ha                                   | 5.8       | 6.5     | 5.8     |
| 6.      | Potassium, kg/ha                                    | 149       | 158     | 142     |
| 7.      | Calcium, kg/ha                                      | 796       | 848     | 826     |
| 8.      | Magnesium, kg/ha                                    | 275       | 293     | 289     |
| 9.      | Sodium, kg/ha                                       | 16        | 18      | 15      |
| 10.     | Chlorides, kg/ha                                    | 43        | 49      | 47      |
| 11.     | Sulphates, kg/ha                                    | 22        | 26      | 23      |
| 12.     | Iron, kg/ha   | 4.6       | 4.5     | 4.8     |
| 13.     | Boron (%)   | 0.00001   | 0.00001 | 0.00001 |
| 14.     | Organic matter (%)                                  | 3.6       | 3.9     | 3.7     |
| 15.     | Microbial Activity (CO <sub>2</sub> evolved /sq.m.) | 1.22      | 0.82    | 0.59    |
| 16.     | Grain size distribution                             |           |         |         |
|         | Sand  | 46        | 49      | 43      |
|         | Clay  | 39        | 38      | 39      |
|         | Silt  | 22        | 21      | 223     |
| 17.     | Sodium Absorption Ratio (SAR)                       | 2.9       | 2.8     | 2.7     |
| 18.     | Natural Moisture content (%)                        | 3.0       | 2.8     | 2.7     |
| 19.     | Field Capacity (%)                                  | --        | 9.6     | --      |
| 20.     | Wilting Co-efficient (%)                            | --        | 0.8     | --      |
| 21.     | Available Water Storage Capacity (%)                | --        | 8.4     | --      |
| 22.     | Bulk Density (gms /cc)                              | 1.24      | 1.27    | 1.31    |
| 23.     | Cation exchange Capacity (cm/hr)                    | 1.33      | 1.36    | 1.38    |
| 24.     | Infiltration rate (cm/hr)                           | --        | 4.8     | --      |
| 25.     | Atterburg Limits                                    |           |         |         |
|         | Liquid limit (%)                                    | 27.4      | 26.9    | 27.6    |
|         | Plastic Limit (%)                                   | 13.1      | 12.7    | 13.3    |
|         | Shrinkage (%)                                       | 4.2       | 4.4     | 3.8     |

## PROFILE

0-30cm  
30 - 60 cm  
Undisturbed sample  
60-100 cm

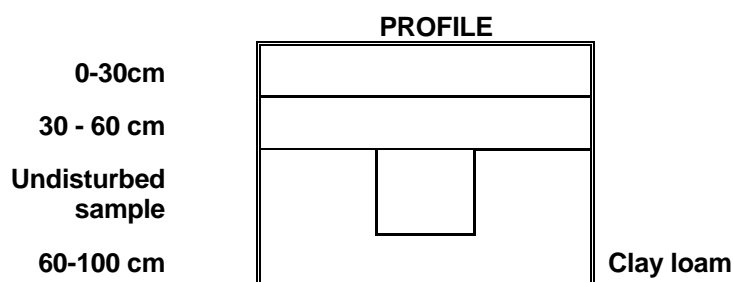


Sandy loam

### SOIL QUALITY DATA

Location : Barren Land, Corezone (S2)

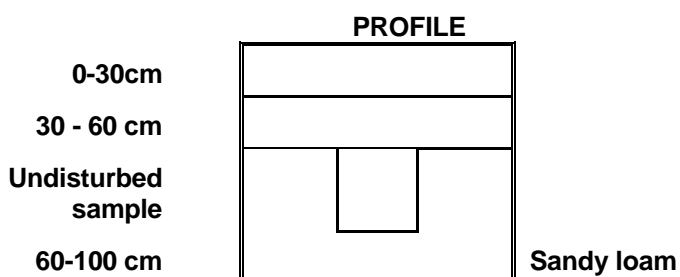
| Sl. No. | Parameter   | Depth, cm |        |        |
|---------|---|-----------|--------|--------|
|         |   | 0-30      | 30-60  | 60-100 |
| 1.      | pH  | 7.40      | 7.10   | 7.12   |
| 2.      | Temperature (°C)                                    | 24.0      | 24.5   | 23.5   |
| 3.      | Electrical conductivity (m-mhos/cm at 20°C)         | 240       | 248    | 258    |
| 4.      | Nitrogen, kg/ha                                     | 59.4      | 62.4   | 67.4   |
| 5.      | Phosphorus, kg/ha                                   | 5.4       | 6.1    | 6.3    |
| 6.      | Potassium, kg/ha                                    | 110       | 118    | 124    |
| 7.      | Calcium, kg/ha                                      | 84        | 88     | 94     |
| 8.      | Magnesium, kg/ha                                    | 94        | 102    | 108    |
| 9.      | Sodium, kg/ha                                       | 25        | 29     | 26     |
| 10.     | Chlorides, kg/ha                                    | 68        | 74     | 88     |
| 11.     | Sulphates, kg/ha                                    | 102       | 124    | 138    |
| 12.     | Iron, kg/ha   | 0.86      | 1.02   | 1.12   |
| 13.     | Boron (%)   | 0.0001    | 0.0001 | 0.0001 |
| 14.     | Organic matter (%)                                  | 0.3       | 0.34   | 0.38   |
| 15.     | Microbial Activity (CO <sub>2</sub> evolved /sq.m.) | 1.28      | 1.38   | 1.46   |
| 16.     | Grain size distribution                             |           |        |        |
|         | Sand  | 48        | 54     | 49     |
|         | Clay  | 32        | 30     | 33     |
|         | Silt  | 20        | 16     | 18     |
| 17.     | Sodium Absorption Ratio (SAR)                       | 4.5       | 4.7    | 4.4    |
| 18.     | Natural Moisture content (%)                        | 6.0       | 6.5    | 6.8    |
| 19.     | Field Capacity (%)                                  | --        | 12.8   | --     |
| 20.     | Wilting Co-efficient (%)                            | --        | 1.4    | --     |
| 21.     | Available Water Storage Capacity (%)                | --        | 11.4   | --     |
| 22.     | Bulk Density (gms /cc)                              | 1.88      | 1.94   | 1.96   |
| 23.     | Cation exchange Capacity (cm/hr)                    | 10.2      | 10.6   | 10.8   |
| 24.     | Infiltration rate (cm/hr)                           | --        | 4.2    | --     |
| 25.     | Atterburg Limits                                    |           |        |        |
|         | Liquid limit (%)                                    | 24.6      | 25.3   | 26.6   |
|         | Plastic Limit (%)                                   | 12.4      | 13.2   | 12.7   |
|         | Shrinkage (%)                                       | 7.4       | 6.8    | 6.5    |



**SOIL QUALITY DATA**

Location : Barrent Land, Near Core Zone (S3)

| Sl.No. | Parameter   | Depth, cm |         |         |
|--------|---|-----------|---------|---------|
|        |   | 0-30      | 30-60   | 60-100  |
| 1.     | pH  | 7.28      | 7.35    | 7.39    |
| 2.     | Temperature (°C)                                    | 27.5      | 25.0    | 23.0    |
| 3.     | Electrical conductivity (m-mhos/cm at 20°C)         | 140       | 148     | 160     |
| 4.     | Nitrogen, kg/ha                                     | 399       | 402     | 415     |
| 5.     | Phosphorus, kg/ha                                   | 4.8       | 4.9     | 4.5     |
| 6.     | Potassium, kg/ha                                    | 146       | 149     | 158     |
| 7.     | Calcium, kg/ha                                      | 788       | 804     | 820     |
| 8.     | Magnesium, kg/ha                                    | 326       | 338     | 346     |
| 9.     | Sodium , kg/ha                                      | 12        | 14      | 13      |
| 10.    | Chlorides, kg/ha                                    | 56        | 60      | 58      |
| 11.    | Sulphates, kg/ha                                    | 27        | 30      | 25      |
| 12.    | Iron, kg/ha   | 4.5       | 4.8     | 5.2     |
| 13.    | Boron (%)   | 0.00001   | 0.00001 | 0.00001 |
| 14.    | Organic matter (%)                                  | 3.9       | 4.6     | 4.3     |
| 15.    | Microbial Activity (CO <sub>2</sub> evolved /sq.m.) | 0.94      | 0.96    | 0.96    |
| 16.    | Grain size distribution                             |           |         |         |
|        | Sand  | 62        | 58      | 54      |
|        | Clay  | 18        | 24      | 28      |
|        | Silt  | 20        | 18      | 18      |
| 17.    | Sodium Absorption Ratio (SAR)                       | 3.0       | 3.1     | 3.3     |
| 18.    | Natural Moisture content (%)                        | 3.1       | 3.3     | 3.5     |
| 19.    | Field Capacity (%)                                  | --        | 7.7     | --      |
| 20.    | Wilting Co-efficient (%)                            | --        | 0.6     | --      |
| 21.    | Available Water Storage Capacity (%)                | --        | 7.1     | --      |
| 22.    | Bulk Density (gms /cc)                              | 1.13      | 1.16    | 1.18    |
| 23.    | Cation exchange Capacity (cm/hr)                    | 1.89      | 1.93    | 1.87    |
| 24.    | Infiltration rate (cm/hr)                           | --        | 4.2     | --      |
| 25.    | Atterburg Limits                                    |           |         |         |
|        | Liquid limit (%)                                    | 23.4      | 22.7    | 22.1    |
|        | Plastic Limit (%)                                   | 12.4      | 12.8    | 12.7    |
|        | Shrinkage (%)                                       | 5.6       | 5.7     | 5.4     |



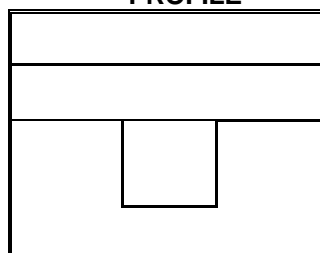
**SOIL QUALITY DATA**

Location : Agricultural Land, Bundia Village (S4)

| Sl. No. | Parameter   | Depth, cm |        |        |
|---------|---|-----------|--------|--------|
|         |   | 0-30      | 30-60  | 60-100 |
| 1.      | pH  | 7.25      | 7.19   | 7.27   |
| 2.      | Temperature (°C)                                    | 27.0      | 24.5   | 23.0   |
| 3.      | Electrical conductivity (m-mhos/cm at 20°C)         | 128       | 132    | 136    |
| 4.      | Nitrogen, kg/ha                                     | 326       | 330    | 339    |
| 5.      | Phosphorus, kg/ha                                   | 3.9       | 3.6    | 3.2    |
| 6.      | Potassium, kg/ha                                    | 128       | 136    | 135    |
| 7.      | Calcium, kg/ha                                      | 737       | 744    | 740    |
| 8.      | Magnesium, kg/ha                                    | 332       | 340    | 337    |
| 9.      | Sodium, kg/ha                                       | 8         | 9      | 7      |
| 10.     | Chlorides, kg/ha                                    | 54        | 57     | 52     |
| 11.     | Sulphates, kg/ha                                    | 29        | 32     | 30     |
| 12.     | Iron, kg/ha   | 5.4       | 5.2    | 4.9    |
| 13.     | Boron (%)   | 0.0001    | 0.0001 | 0.0001 |
| 14.     | Organic matter (%)                                  | 3.0       | 2.8    | 2.7    |
| 15.     | Microbial Activity (CO <sub>2</sub> evolved /sq.m.) | 0.94      | 0.96   | 0.88   |
| 16.     | Grain size distribution                             |           |        |        |
|         | Sand  | 68        | 64     | 62     |
|         | Clay  | 19        | 20     | 18     |
|         | Silt  | 13        | 16     | 20     |
| 17.     | Sodium Absorption Ratio (SAR)                       | 3.1       | 2.8    | 2.6    |
| 18.     | Natural Moisture content (%)                        | 3.4       | 3.2    | 3.0    |
| 19.     | Field Capacity (%)                                  | --        | 5.4    | --     |
| 20.     | Wilting Co-efficient (%)                            | --        | 0.6    | --     |
| 21.     | Available Water Storage Capacity (%)                | --        | 6.7    | --     |
| 22.     | Bulk Density (gms/cc)                               | 0.88      | 0.85   | 0.82   |
| 23.     | Cation exchange Capacity (cm/hr)                    | 1.44      | 1.37   | 1.31   |
| 24.     | Infiltration rate (cm/hr)                           | --        | 5.2    | --     |
| 25.     | Atterburg Limits                                    |           |        |        |
|         | Liquid limit (%)                                    | 19.2      | 19.6   | 20.2   |
|         | Plastic Limit (%)                                   | 10.8      | 11.4   | 11.8   |
|         | Shrinkage (%)                                       | 4.7       | 4.8    | 4.6    |

**PROFILE**

0-30cm  
30 - 60 cm  
Undisturbed sample  
60-100 cm

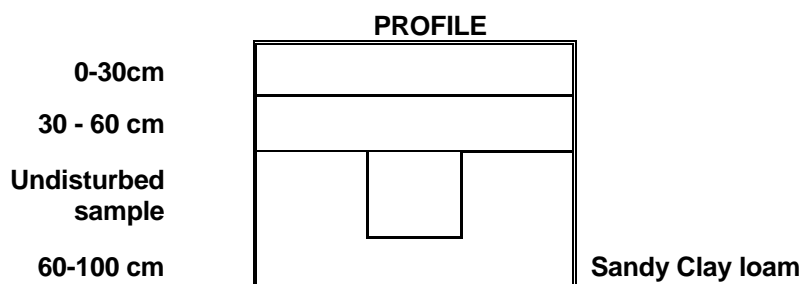


Sandy Clay loam

**SOIL QUALITY DATA**

Location : Agricultural Land, Gangapur village (S5)

| Sl. No. | Parameter   | Depth, cm |        |        |
|---------|---|-----------|--------|--------|
|         |   | 0-30      | 30-60  | 60-100 |
| 1.      | pH  | 7.45      | 7.32   | 7.28   |
| 2.      | Temperature (°C)                                    | 27.0      | 24.5   | 23.5   |
| 3.      | Electrical conductivity (m-mhos/cm at 20°C)         | 134       | 146    | 152    |
| 4.      | Nitrogen, kg/ha                                     | 262       | 266    | 275    |
| 5.      | Phosphorus, kg/ha                                   | 5.6       | 5.9    | 5.4    |
| 6.      | Potassium, kg/ha                                    | 158       | 160    | 164    |
| 7.      | Calcium, kg/ha                                      | 798       | 832    | 838    |
| 8.      | Magnesium, kg/ha                                    | 410       | 414    | 422    |
| 9.      | Sodium, kg/ha                                       | 10        | 12     | 14     |
| 10.     | Chlorides, kg/ha                                    | 44        | 48     | 46     |
| 11.     | Sulphates, kg/ha                                    | 68        | 72     | 74     |
| 12.     | Iron, kg/ha   | 4.4       | 4.6    | 4.8    |
| 13.     | Boron (%)   | 0.0001    | 0.0001 | 0.0001 |
| 14.     | Organic matter (%)                                  | 3.2       | 2.9    | 2.8    |
| 15.     | Microbial Activity (CO <sub>2</sub> evolved /sq.m.) | 1.21      | 1.14   | 1.11   |
| 16.     | Grain size distribution                             |           |        |        |
|         | Sand  | 66        | 70     | 68     |
|         | Clay  | 18        | 14     | 16     |
|         | Silt  | 16        | 16     | 16     |
| 17.     | Sodium Absorption Ratio (SAR)                       | 4.22      | 4.18   | 4.14   |
| 18.     | Natural Moisture content (%)                        | 3.8       | 3.6    | 3.4    |
| 19.     | Field Capacity (%)                                  | --        | 5.7    | --     |
| 20.     | Wilting Co-efficient (%)                            | --        | 0.4    | --     |
| 21.     | Available Water Storage Capacity (%)                | --        | 5.6    | --     |
| 22.     | Bulk Density (gms /cc)                              | 1.40      | 1.44   | 1.41   |
| 23.     | Cation exchange Capacity (cm/hr)                    | 2.22      | 2.24   | 2.27   |
| 24.     | Infiltration rate (cm/hr)                           | --        | 3.5    | --     |
| 25.     | Atterburg Limits                                    |           |        |        |
|         | Liquid limit (%)                                    | 22.7      | 23.5   | 23.7   |
|         | Plastic Limit (%)                                   | 15.0      | 14.4   | 14.5   |
|         | Shrinkage (%)                                       | 6.4       | 6.2    | 6.3    |



## Annexure-III

OFFICE OF THE DIVISIONAL FOREST OFFICER,  
SAMBALPUR NORTH FOREST DIVISION, SAMBALPUR.

Memo No. 2059 /Dated 22-08-2012.

To

✓ The Chief Conservator of Forests,  
Forest Diversion & Nodal Officer, FC Act,  
O/O the PCCF, Odisha.

Sub: Proposal for diversion of 99.06 ha of forest land for surface breaking and permission for 1064.93 ha for underground activities for Orient Underground Mine No.-1&2, Mine No.-3, Hingir-Rampur Colliery & Hirakhand Bundia Mine (Combine) by MCL in Jharsuguda District. (State SI No.420/10, dt.26.08.2010).

I am submitting herewith the digital plan both in hard and soft copy prepared by Odisha Space Application Centre (ORSAC) for Orient Underground Mine No.1 & 2, Mine No.3, HRC & HBM (Combine) of MCL for favour of necessary action at your end.

Encl: (1) Digital plan hard copy = 4 nos.  
(2) Soft copy = 4 nos. CD.

*[Signature]* 22/8/12  
Divisional Forest Officer,  
Sambalpur North Forest Division.

Memo No. 2060 /Dated 22-08-2012

Copy alongwith a copy of digital plan both in hard copy and soft copy of Orient Underground Mine No.-1&2, Mine No.-3, HRC & HBM (Combine) is submitted herewith to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information and necessary action.

*[Signature]* 22/8/12  
Divisional Forest Officer,  
Sambalpur North Forest Division.

Memo No. 2061 /Dated 22-08-2012

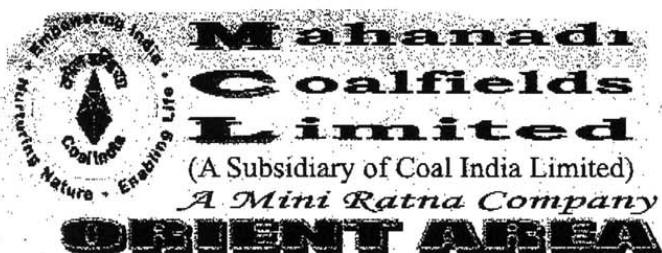
Copy forwarded to the General Manager, Orient Area, MCL, Brajarajnagar for information and necessary action.

*[Signature]* 22/8/12  
Divisional Forest Officer,  
Sambalpur North Forest Division.

*Received*  
*23.8.12*

|  |
|--|
| <p>PRINCIPAL CHIEF CONSERVATOR OF FORESTS<br/>ODISHA, BHUBANESWAR</p> <p>23 AUG 2012</p> <p>Received No.....</p> <p>Rec.....</p> |
|--|

Annexure-III (Contd.)



Regd. Office : Jagruti Vihar,  
Post : Jagruti Vihar, Burla,  
Dist: Sambalpur (Odisha).

Ref. No. MCL:GM:OA:Secy:F-25: 276

PHONE - 242190  
PBX - 242891, 242893  
Fax - 242190

e-mail: orient\_mcl@rediffmail.com

**MAHANADI COALFIELDS LIMITED**  
**Office of the General Manager**  
**ORIENT AREA**

Post Box No. 31,  
Post: Brajrajnagar-768216  
Dist: Jharsuguda (Odisha).

Date: 18-08-2012

To  
✓ **The Divisional Forest Officer,**  
**Sambalpur North Division,**  
**SAMBALPUR.**

Dear Sir,

We are hereby submitting 06(six) copies each of DGPS/Digital Geo-Referencing maps along with 06 (six) nos. each of soft copies made in CDs as authenticated by ORSAC as per the guidelines issued by Special Secretary to Govt. of Odisha, Deptt. of Forest and Environment, Bhubaneswar with regards to State Srl. No. 420/10, dtd. 26-08-2010 for our forest diversion/underground permission application in respect of Orient Colliery Mine No. 1&2, Orient Colliery Mine No. 3, Hingir Rampur Colliery and Hirakhand Bundia Mine (combined).

You are, therefore, requested to kindly forward the same to CCF (Nodal), Bhubaneswar without any further delay for forwarding our forest diversion/underground permission application for Stage-I clearance to MoEF, Govt. of India, so that, compliance to the CEC recommendation and Hon'ble Apex Court's Order dtd. 19-03-2012 can be made.

Thanking you,

Yours faithfully,

Encl: **18 copies of hard copy**  
**& 18 copies soft copy as above.**

*Atandhy 18.8.12*  
**General Manager,**  
**Orient Area, MCL.**

cc to: CCF (Nodal), Bhubaneswar.  
cc to: RCCF, Sambalpur.  
cc to: Director of Mines, Bhubaneswar.  
cc to: Dy. Director, Mines, Sambalpur Circle, Sambalpur.  
cc to: Area Survey Officer, Orient Area.

Annexure-III(Contd.)

OFFICE OF THE DIVISIONAL FOREST OFFICER  
SAMBALPUR NORTH FOREST DIVISION, SAMBALPUR.

Memo No: 1913 /Dated 01/08/2012

To,  
The Chief Conservator of Forests  
Forest Conservation & Nodal Officer, FC Act.  
Office of the PCCF, Odisha.

Sub: Submission of digital data geo-reference Map prepared by Odisha Space Application Centre (ORSAC) for diversion of 8.259 (Ha) forest land for surface breaking and permission of 389.180 (Ha) for underground activities for Orient underground Mine No-4 against (State SI.No:310/09, Dtd:07.04.2009) by MCL in Jharsuguda Dist. for applications under Forest Conservation Act-1980.

I am submitting herewith the digital plan both in hard copy and soft copy prepared by Odisha Space Application Centre (ORSAC) for Orient underground Mine No-4 against (State SI.No:310/09, Dtd:07.04.2009) of MCL for favour of necessary action at your end.

Encl: (1) Digital plan hard copy=04 Nos.  
(2) Digital plan soft copy =04 Nos.

*Am 1/8/12*  
Divisional Forest Officer,  
Sambalpur North Forest Division.

Memo No: /Dated - 2012

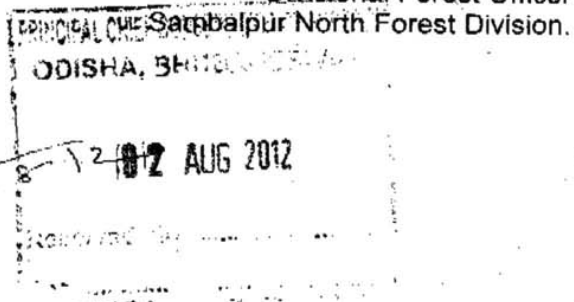
Copy alongwith a copy of digital plan both in hard copy and soft copy of Orient underground Mine No-4 is submitted herewith to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information and necessary action.

Divisional Forest Officer  
Sambalpur North Forest Division.

Memo No: /Dated -2012

Copy forwarded to the General Manager, Orient Area, MCL, Brajrajnagar for information and necessary action.

Divisional Forest Officer  
Sambalpur North Forest Division.



Annexure-III(Contd.)



# **Mahanadi Coalfields Limited**

(A Subsidiary of Coal India Limited)

*A Mini Ratna Company*

## **ORIENT AREA**

**Regd. Office : Jagruti Vihar,  
Post : Jagruti Vihar, Burla,  
Dist: Sambalpur (Odisha).**

**Ref. No. MCL:GM:OA:Secy:F-25: 254**

**Phone – 06645 - 242134  
PBX - 242891, 242893  
Fax - 242190**

**e-mail: orient\_mcl@rediffmail.com**

**MAHANADI COALFIELDS LIMITED  
Office of the General Manager  
ORIENT AREA**

**Post Box No. 31,  
Post: Brajrajnagar-768216  
Dist: Jharsuguda(Odisha).**

**Date: 31-07-2012**

**To  
✓ The Divisional Forest Officer,  
Sambalpur North Division,  
SAMBALPUR.**

Dear Sir,

We are hereby submitting 06 (six) copies of DGPS/Digital Geo-Referencing maps 06 (six) nos. of soft copies made in CDs as authenticated by ORSAC as per the guidelines issued by Special Secretary to Govt. of Odisha, Deptt. of Forest & Environment, Bhubaneswar with regards to State Sl. No. 310/09, dtd. 07-04-2009 for our forest diversion/underground permission application.

You are, therefore, requested to kindly forward the same to CCF (Nodal), Bhubaneswar without any further delay for forwarding our forest diversion/underground permission application for Stage-I clearance to MoEF, so that, compliance to the CEC recommendation and Hon'ble Apex Court's Order dtd. 19-03-2012 can be made.

Thanking you,

Yours faithfully,

Encl: **As above.**

cc to: CCF (Nodal), Bhubaneswar.  
cc to: RCCF, Sambalpur.  
cc to: Director of Mines, Bhubaneswar.  
cc to: Dy. Director, Mines, Sambalpur Circle, Sambalpur.

*Sd/- 31.7.12*  
**General Manager,  
Orient Area, MCL.**

Annexure-III(Contd.)

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS, ODISHA  
BHUBANESWAR

Memo No. /9F(MG)-522/2010  
Dated, Bhubaneswar, the April, 2012

To

The Divisional Forest Officer,  
Sambalpur (North) Forest Division.  
Sambalpur.

Sub: Diversion proposal for 99.06 ha of forest land for surface breaking Pre-80 and permission for 1064.93 ha for underground activities for Orient Underground Mine No. 1&2, mine No. 3, Hingir Rampur Colliery & Hirakuda Bundia Mines (Combine) by Orient Area, MCL in Jharsuguda District. (State SI No. 420/10 dt. 26.08.2010).

Ref: This office Memo No. 19351 dated 24.12.2011.

In inviting a reference to this office Memo cited above on the mentioned subject the required DGPS or total station geo-referenced boundary map for the forest land proposed to be diverted containing a digital map both in hard and soft copy along with shape file furnished to this office immediately for taking necessary action.

This is most urgent.

Sd/-

Chief Conservator of Forests  
Forest Diversion & Nodal Officer, F.C. Act

Memo No. /Dt.

Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur Circle for information and necessary action.

Sd/-

Chief Conservator of Forests  
Forest Diversion & Nodal Officer, F.C. Act

Memo No. 6060 /Dt. 05-04-12

Copy forwarded to the General Manager, Orient Area Mahanadi Coalfield Limited, Post Box- 31, Post- Brajrajnagar, Dist- Jharsuguda (Odisha) Pin- 768216 for information and necessary action.

Sd/- 5.4.12

Chief Conservator of Forests  
Forest Diversion & Nodal Officer, F.C. Act

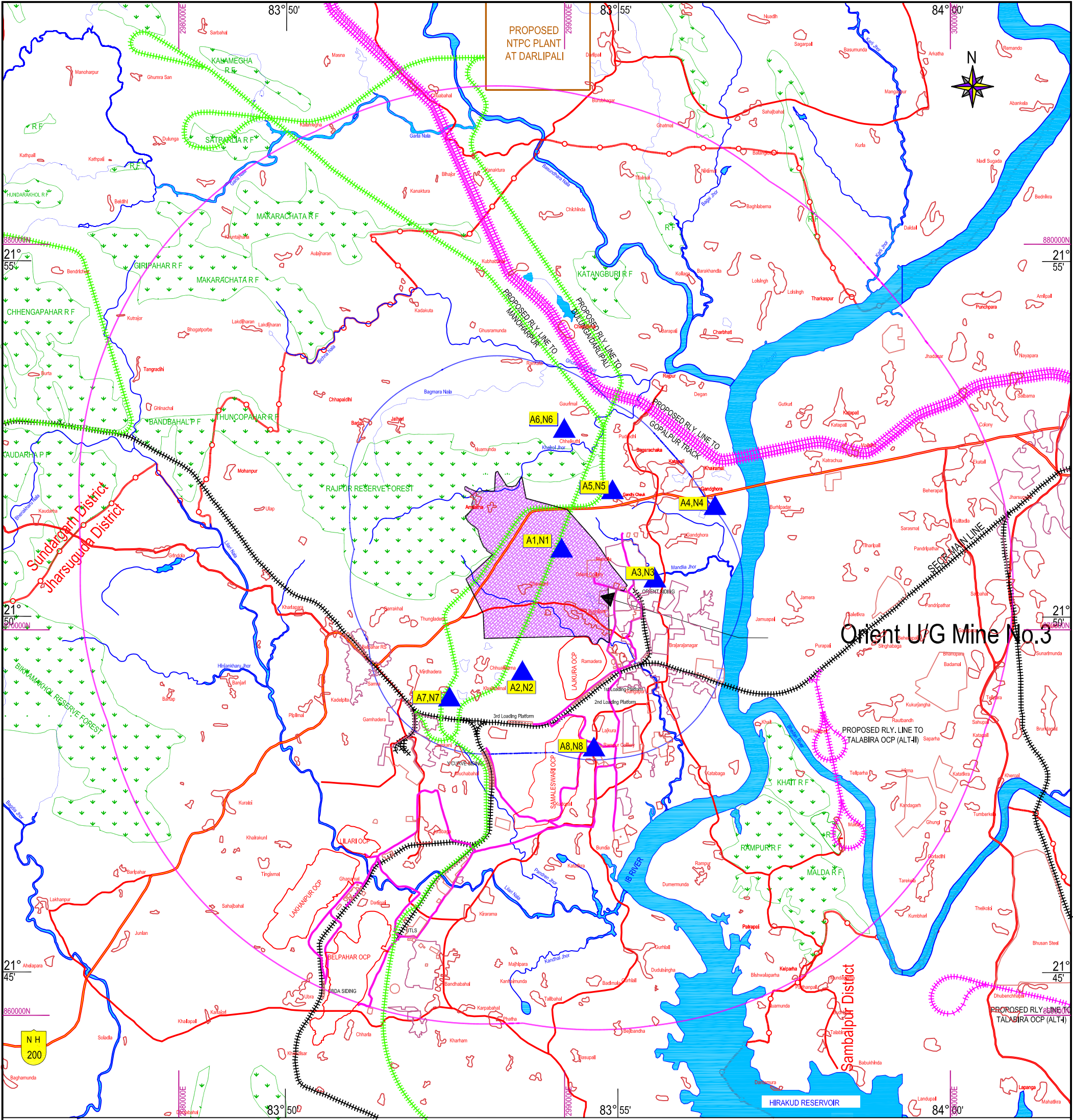
SAM'S (K872-08A)  
for land information  
24/4/12

SC(SUR)

Sd/-  
Gm/In

321/8  
16/4/2012

copy circulated  
24/4/12



▲ Ambient Air Quality & Noise Monitoring station

- A1,N1 - Core zone, Store
- A2,N2 - Core zone, Near Temple
- A3,N3 - Mandla village
- A4,N4 - Ghandghora village
- A5,N5 - Gandhi Chowk
- A6,N6 - Chheikuthi village
- A7,N7 - Jamakani Village,
- A8,N8 - Lajkura Village

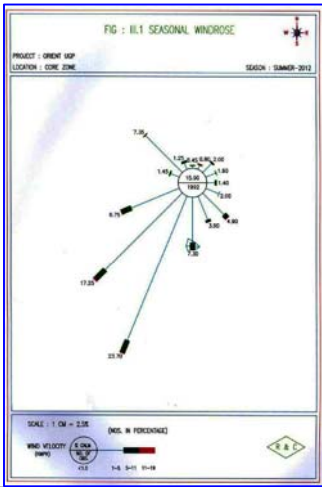


PLATE NO. I

Note: Forest Boundaries Are Taken From Survey of India Toposheets

INDEX

- National Highway
- State Highway/MDR
- Other Road
- Railway Line (Existing & Proposed)
- Forest Boundary
- 10km Buffer Boundary
- 3km Buffer Boundary
- Mine Lease Boundary
- State/District Boundary

Mahanadi Coalfields Limited

Job Title: EIA-EMP Of Orient U/G Mine No. 3

Job No.  
706100

Subject  
Surface Plan Showing Air & Noise Monitoring Station  
Baseline Data by Richardson & Crudass Ltd.

| Activity  | Name             | Desig.            | Signature | Date      |
|-----------|------------------|-------------------|-----------|-----------|
| Processed | T. K. Das        | Sr.Manager(Civ)   |           | 17.5.2012 |
| Processed | A. K. Samantaray | Sr.Manager (Env.) |           | 17.5.2012 |
| Checked   | S. P. Mohanty    | Dy. GM (GMT)      |           | 17.5.2012 |
| Approved  | Amarjit Singh    | R.D. (R-III)      |           | 17.5.2012 |

CMPDI  
ISO 9001:2000 Company

Scale  
0 0.5 1.0 1.5 2.0 3.0 Km

Sheet 1 of 1

Drg.No. R 7 GMT 3 0 0 1 9 3 REV.No. 0

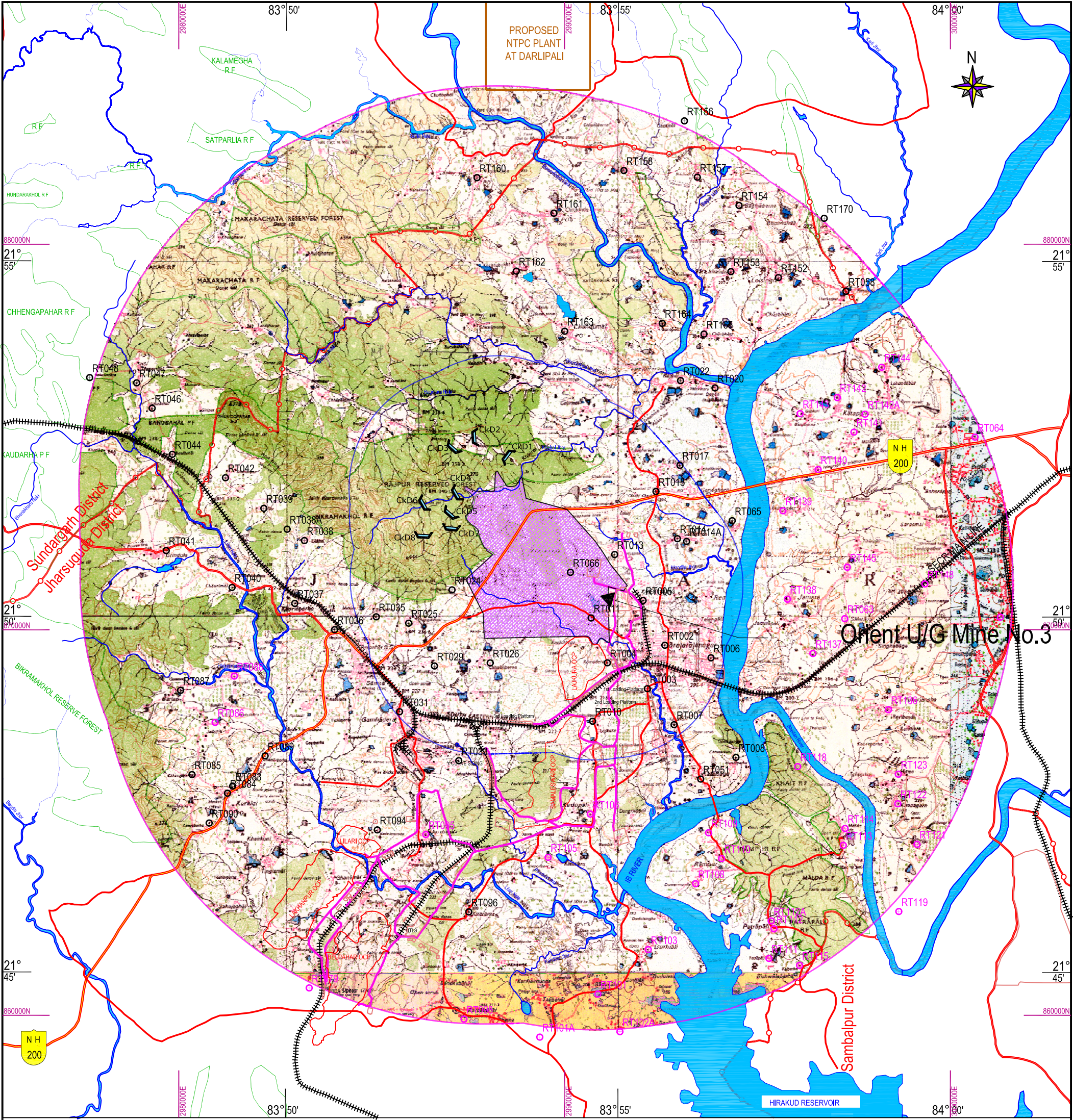


PLATE NO. II

INDEX

National Highway

State Highway/MDR

Other Road

Railway Line

Forest Boundary

10km Buffer Boundary

3km Buffer Boundary

Mine Lease Boundary

State/District Boundary

RT085

HYDROGRAPH STATIONS

Check Dam

CKD2

Note: Forest Boundaries Are Taken From Survey of India Toposheets

| Mahanadi Coalfields Limited  |  |                                       |                  |                   |              |
|--|--|---------------------------------------|------------------|-------------------|--------------|
| Job Title: EIA-EMP Of Orient U/G Mine No. 3  |  |                                       |                  | Job No. 706100    |              |
| Subject<br>Study Area Map of Orient U/G Mine No. 3 Including 10Km Buffer Zone, Ib-Valley Coalfield |  | Activity                              | Name             | Desig.            | Signature    |
|  |  | Processed                             | T. K. Das        | Sr.Manager(Civ)   | 17.12.2010   |
|  |  | Processed                             | A. K. Samantaray | Sr.Manager (Env.) | 17.12.2010   |
|  |  | Checked                               | S. P. Mohanty    | Dy. GM (GMT)      | 17.12.2010   |
|  |  | Approved                              | Amarjit Singh    | R.D. (R+M)        | 17.12.2010   |
| CMPDI<br>ISO 9001:2000 Company   |  | Scale<br>0 0.5 1.0 1.5 2.0 3.0 4.0 Km |                  |                   | Sheet 1 of 1 |
|  |  | Drg.No. R 7 GMT 3 0 0 1 9 5           |                  |                   | REV.No. 0    |